



Armed Forces College of Medicine

AFCM

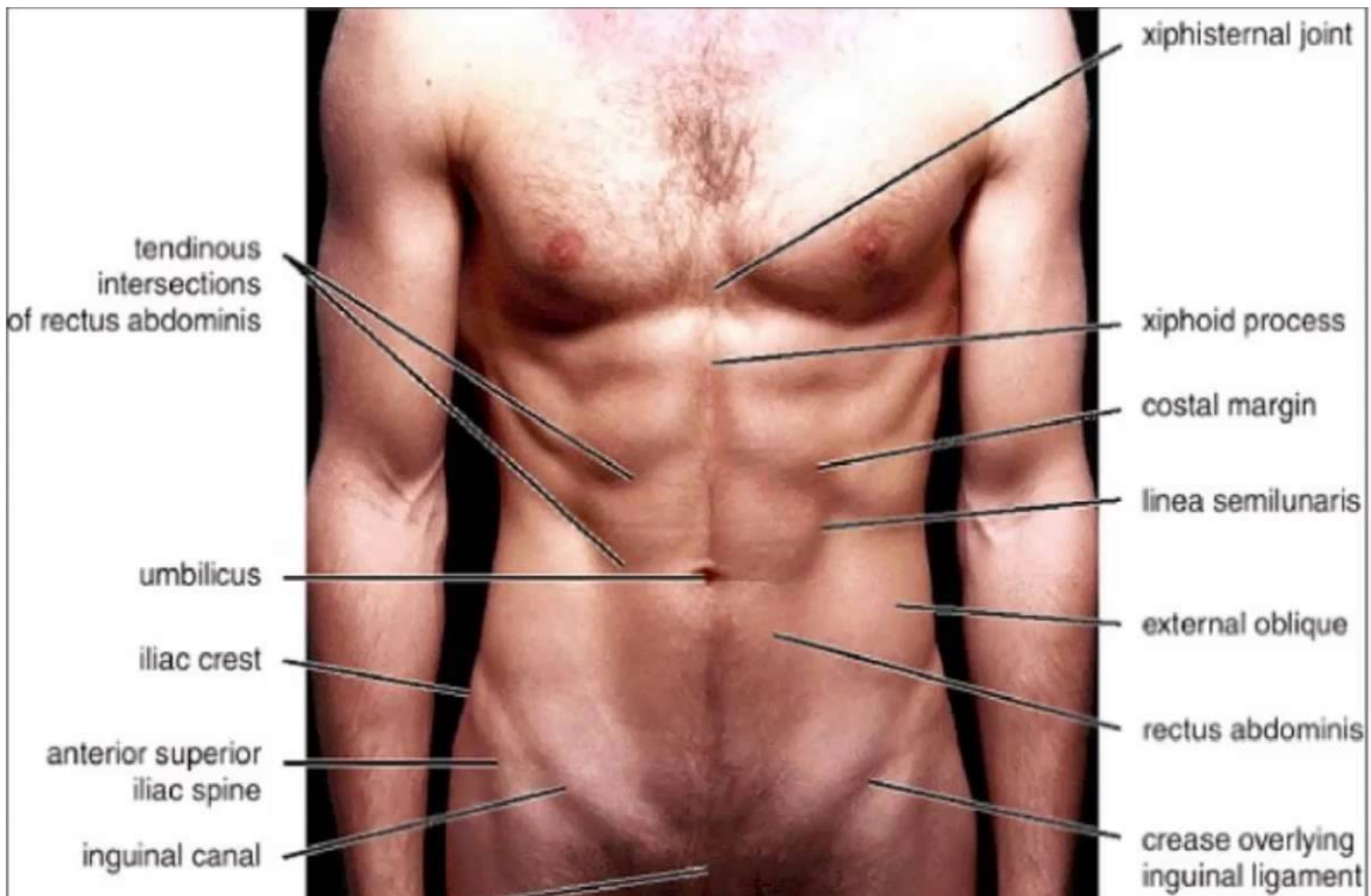
ANTERIOR ABDOMINAL WALL



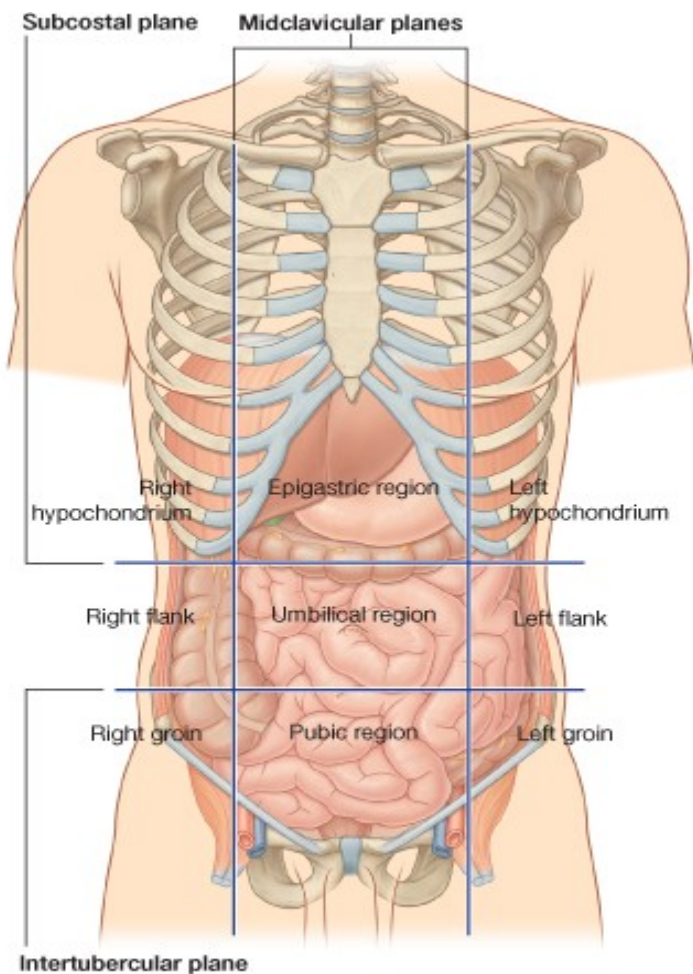
INTENDED LEARNING OBJECTIVES (ILO)

By the end of this lecture the student will be able to:

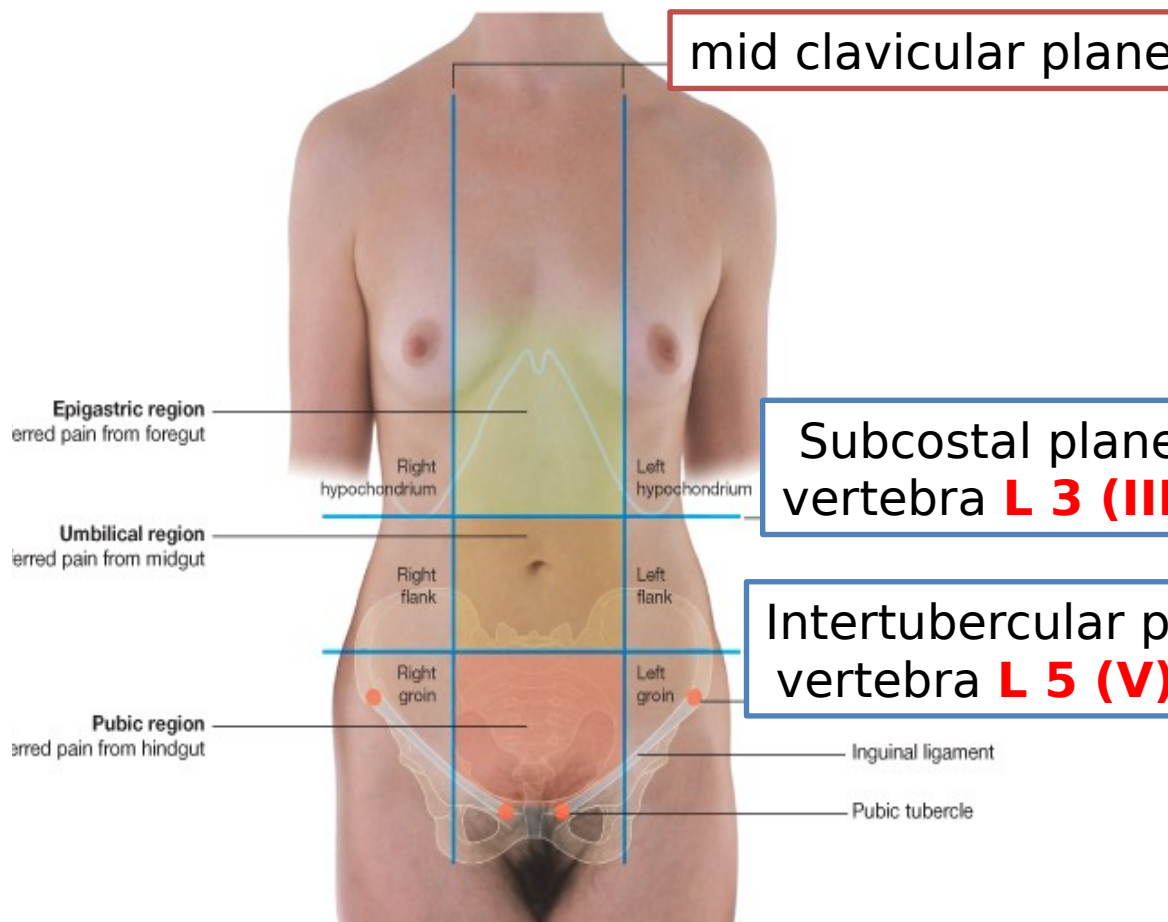
1. List the layers of the abdominal wall
2. List muscles forming anterior abdominal wall
3. Describe the attachments & actions of the muscles
4. Describe the motor and sensory nerves of the anterior abdominal wall
5. Describe formation of the rectus sheath and list



nine-region organizational pattern

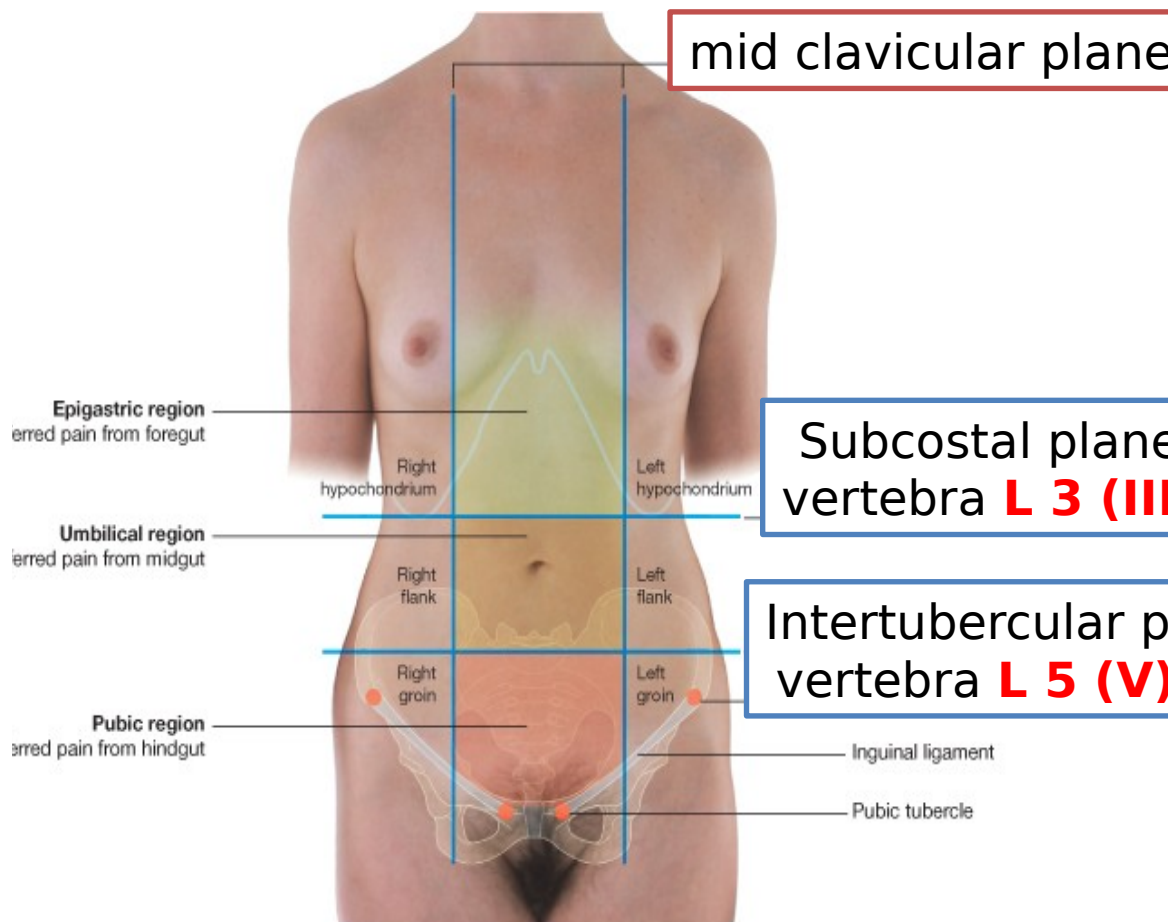
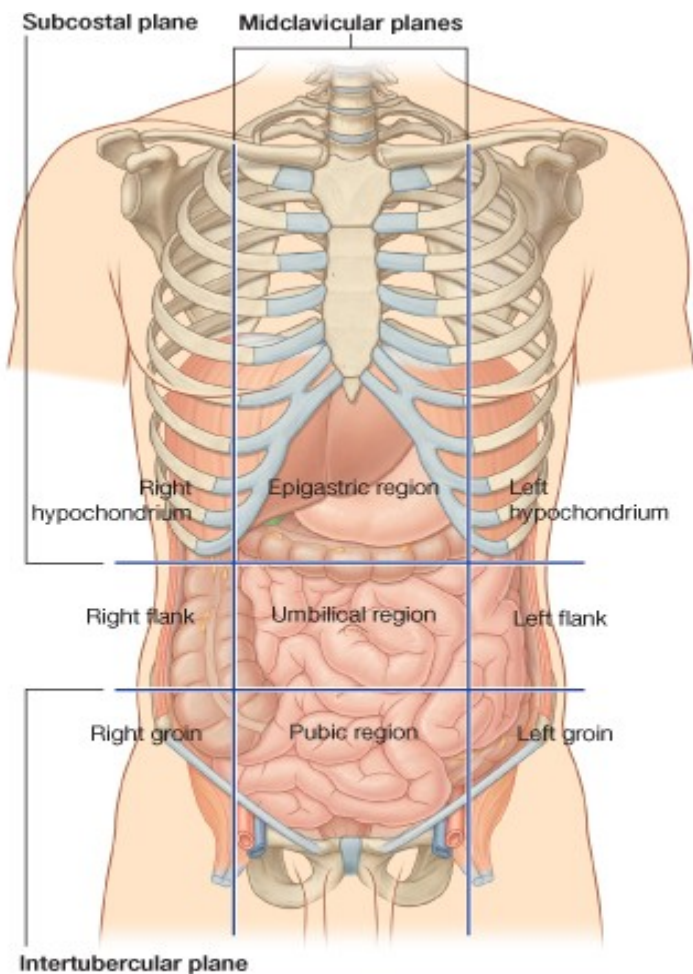


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nine-region organizational pattern



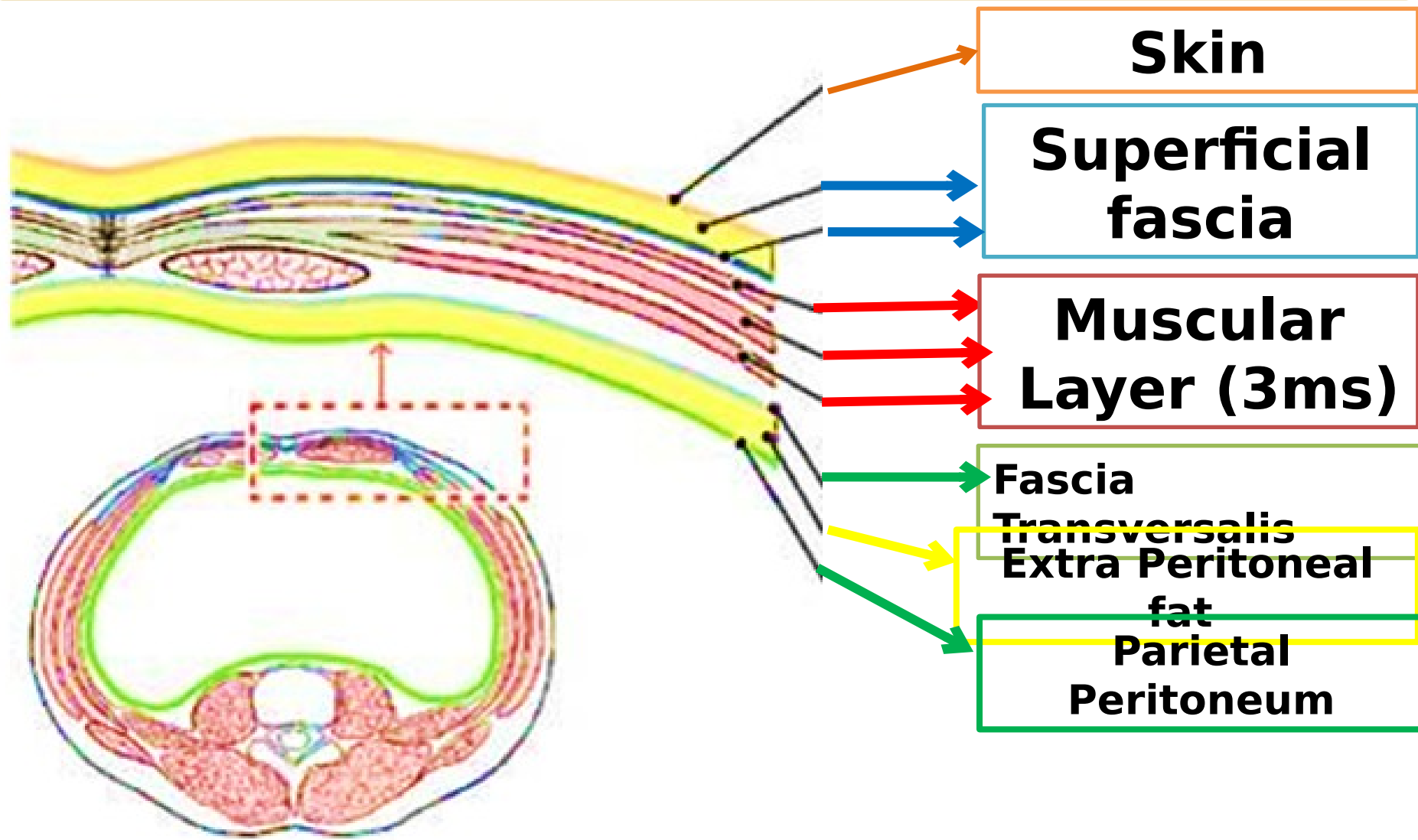


Abdomen

Coverings:

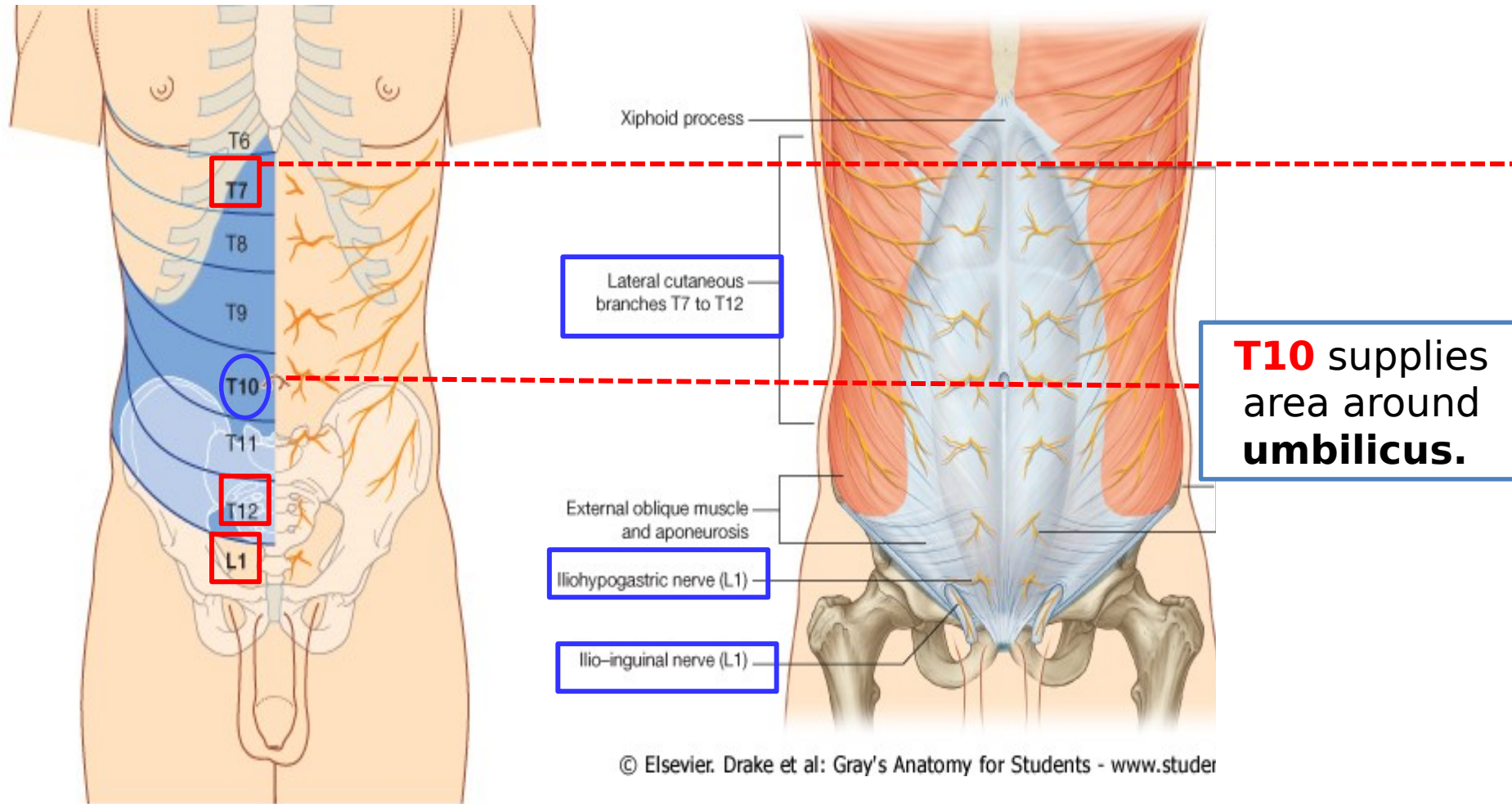
- 1- Skin.
- 2- Superficial fascia (***No Deep Fascia***).
- 3- Muscle layer.
- 4- Fascia transversalis.
- 5- Extra peritoneal fat.

Layers of Anterior Abdominal Wall

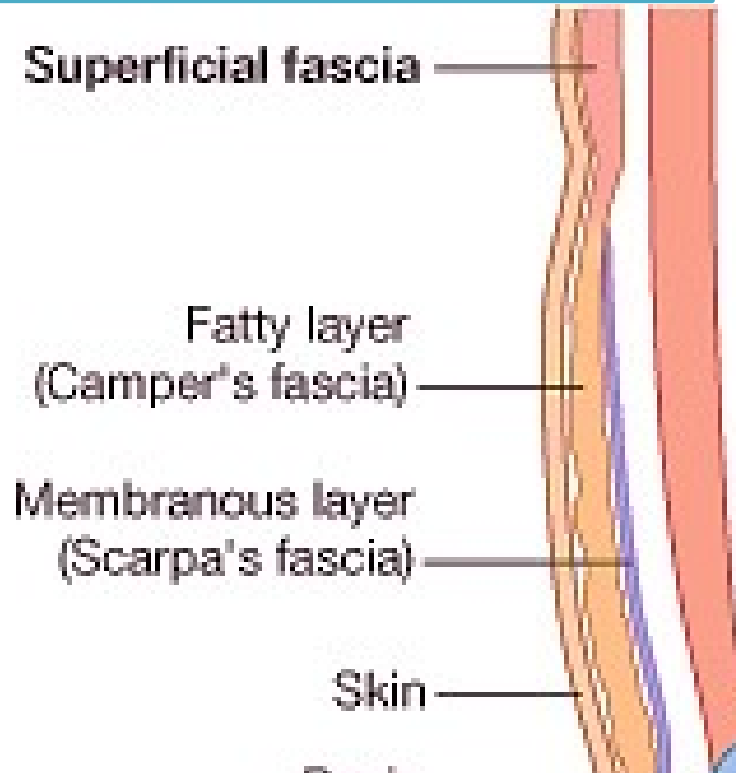
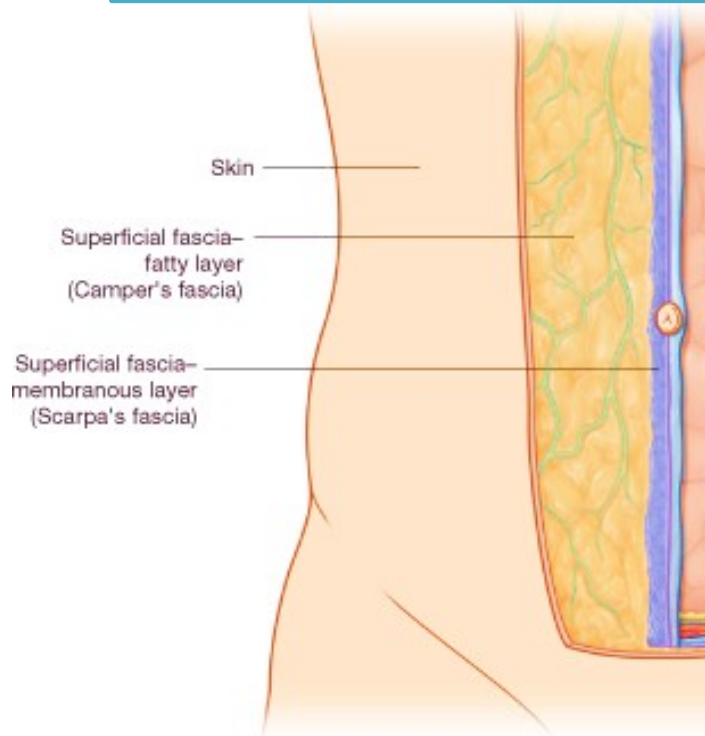


Innervation

The skin and muscles of the anterolateral abdominal wall are supplied by T7 to T12 and L1 spinal nerves



Superficial fascia



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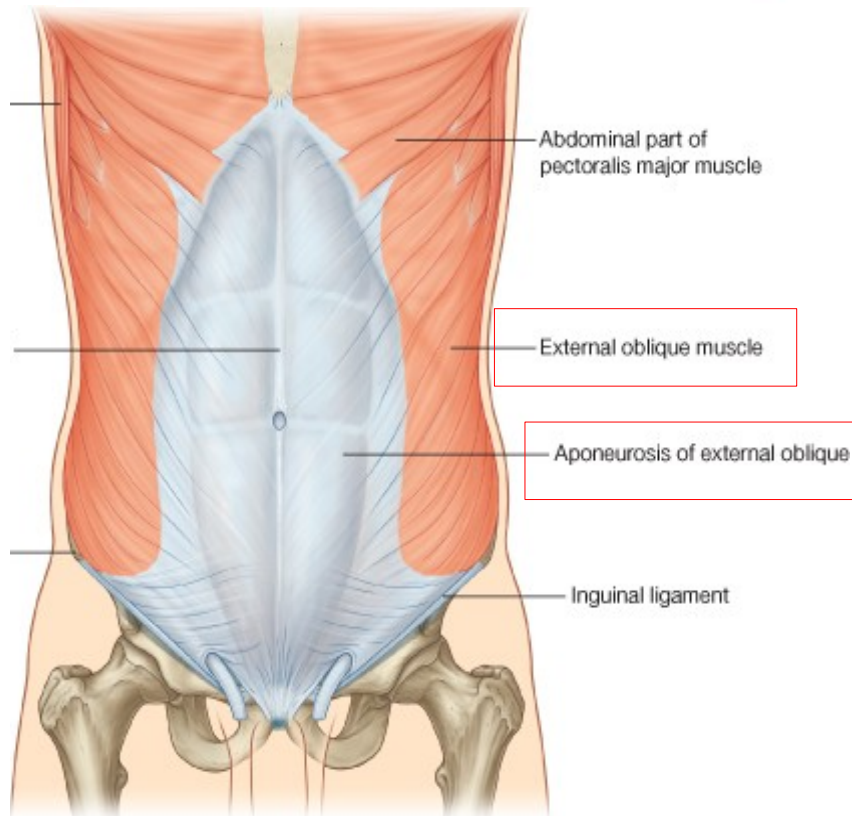
No deep fascia in ant. abd. Wall because deep fascia is non stretchable

Below umbilicus, superficial fascia is formed of 2 layers:

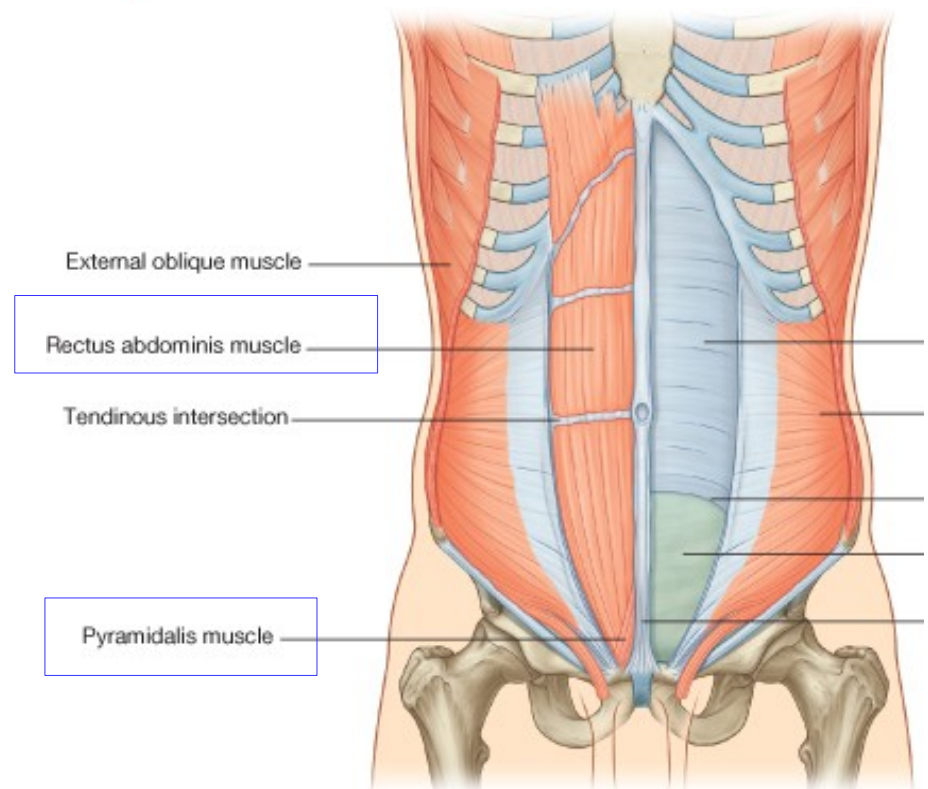
- 1. superficial fatty layer Camper's fascia**
- 2. deep membranous layer Scarpa's fascia**

Muscles of anterior abdominal wall

three flat muscles



two vertical muscles





Muscles of anterior abdominal wall

three flat muscles

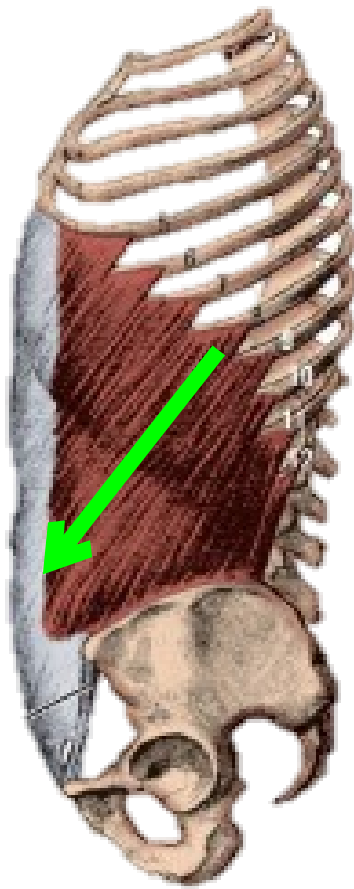
- ☐ **External Oblique**
- ☐ **Internal Oblique**
- ☐ **Transversus Abdominis**

two vertical muscles

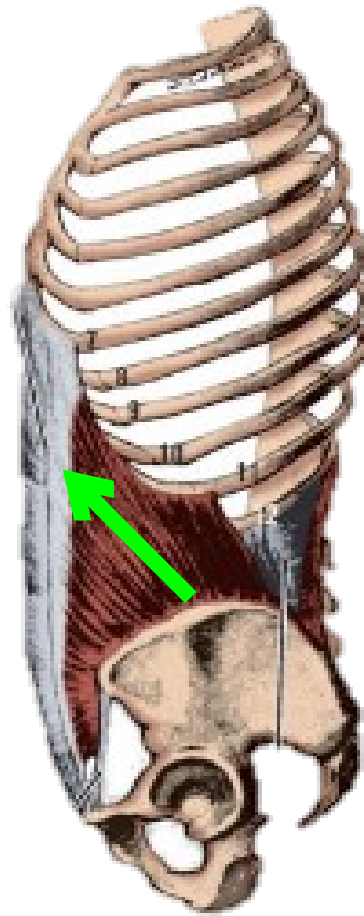
- ☐ **Rectus abdominis**
- ☐ **Pyramidalis**

- Two muscles lie close to midline
- Invested by sheath

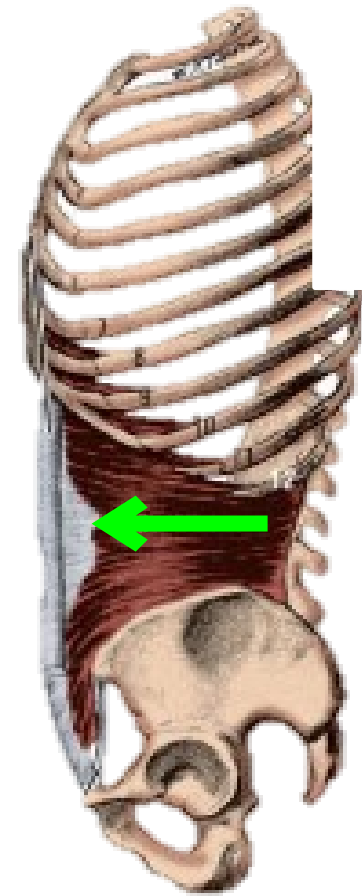
- 3 large & broad muscles
- lie on anterolateral aspect of abdomen
- Insertion by flat **aponeurosis** to linea alba



**External
Oblique**



**Internal
Oblique**



**Transversus
abdominis**

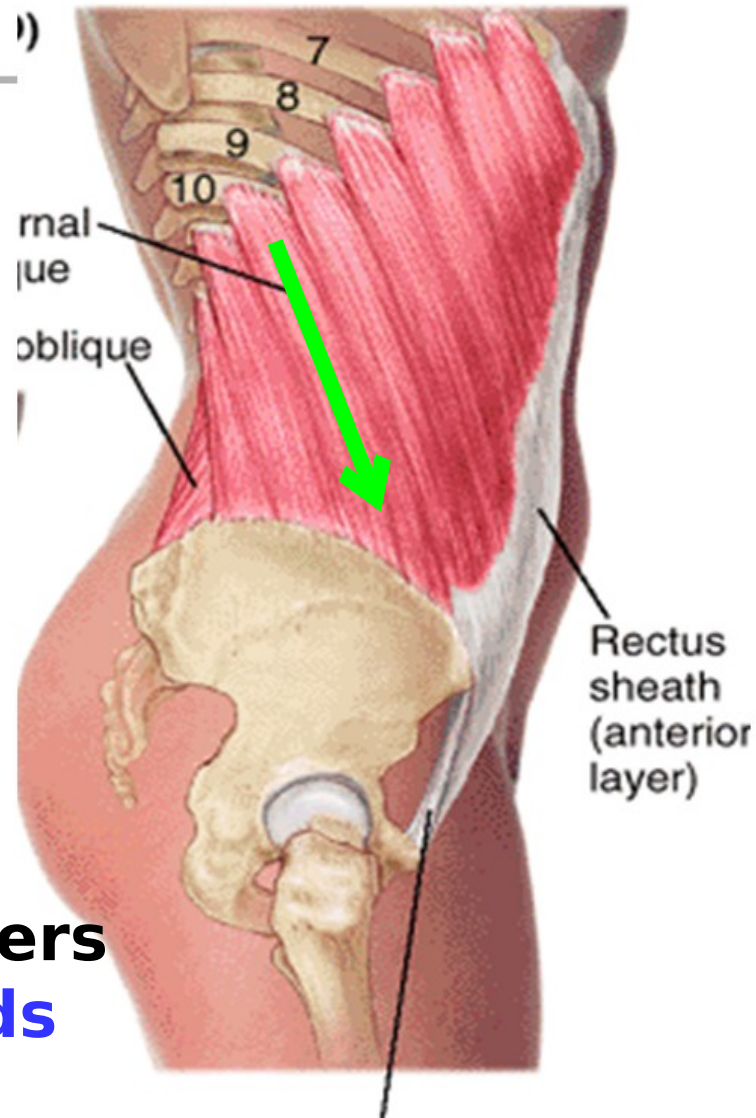
Fibers run in three different directions to strengthen the anterior abdominal wall.

External Oblique Muscle.

■ ***Origin:***

From the outer surfaces
of the lower eight
ribs.

- **The direction of fibers**
pass down, forwards
& medially

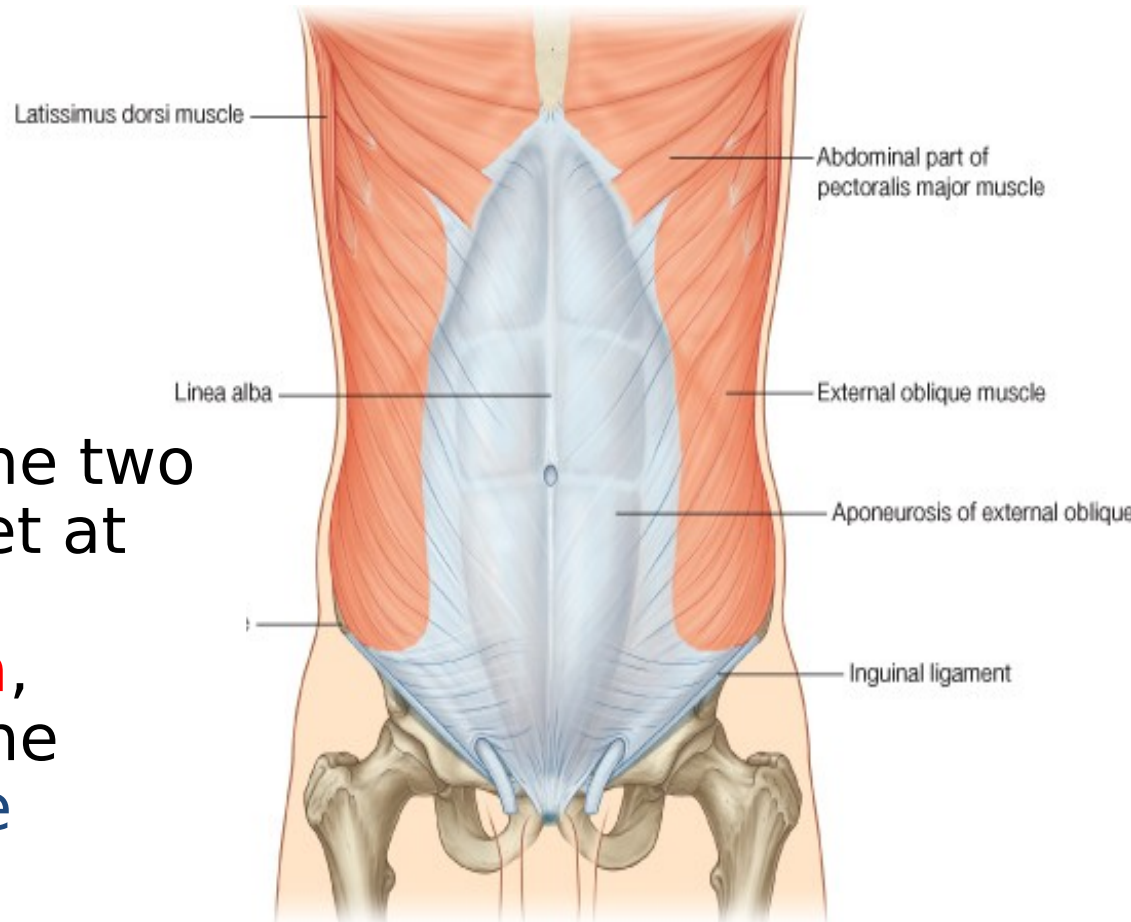


External Oblique Muscle.

insertion

Aponeuroses

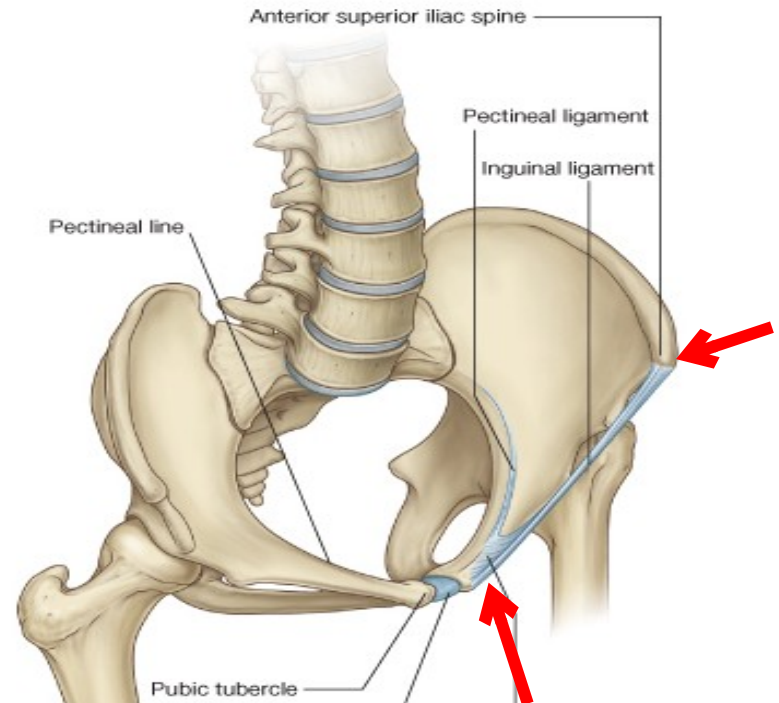
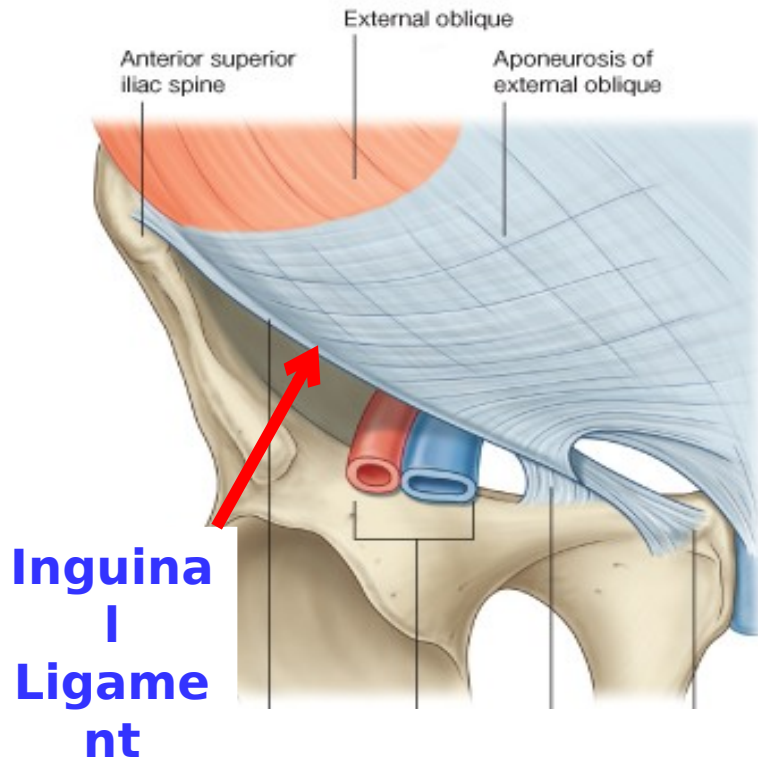
- The **aponeuroses** of the two external obliques meet at the midline
- forming the **linea alba**, which extends from the xiphoid process to the symphysis pubis.
- The **aponeuroses** pass in front of **rectus abdominus**



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External Oblique Muscle.

Inguinal Ligament



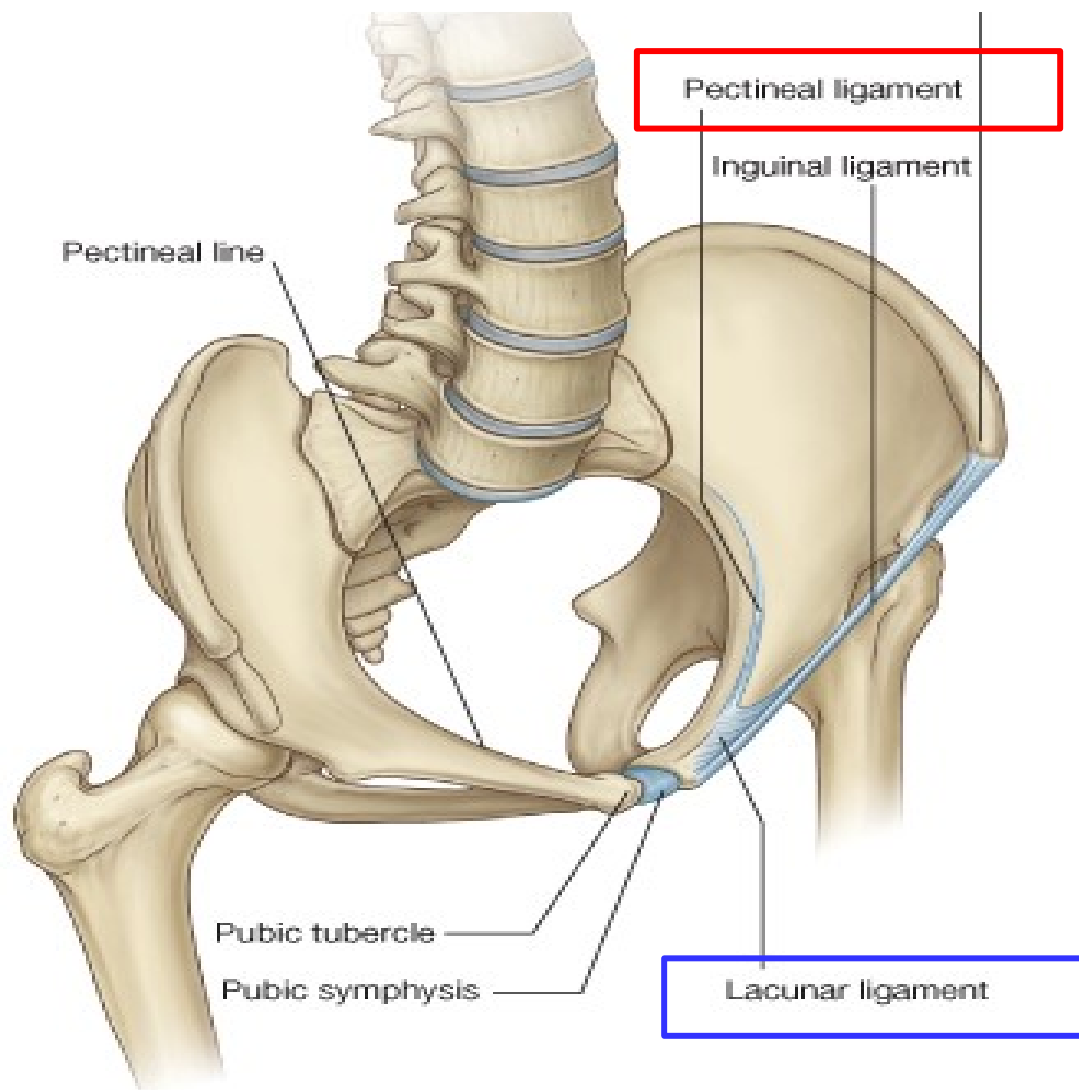
The lower border of the external oblique aponeurosis is folded backwards on itself to form the inguinal ligament.

The inguinal ligament is attached:

➤ **Medially : pubic tubercle**

➤ **Laterally : ASIS**

er ligaments extend from the inguinal ligamen



Pectineal ligament: (Cooper's lig.)

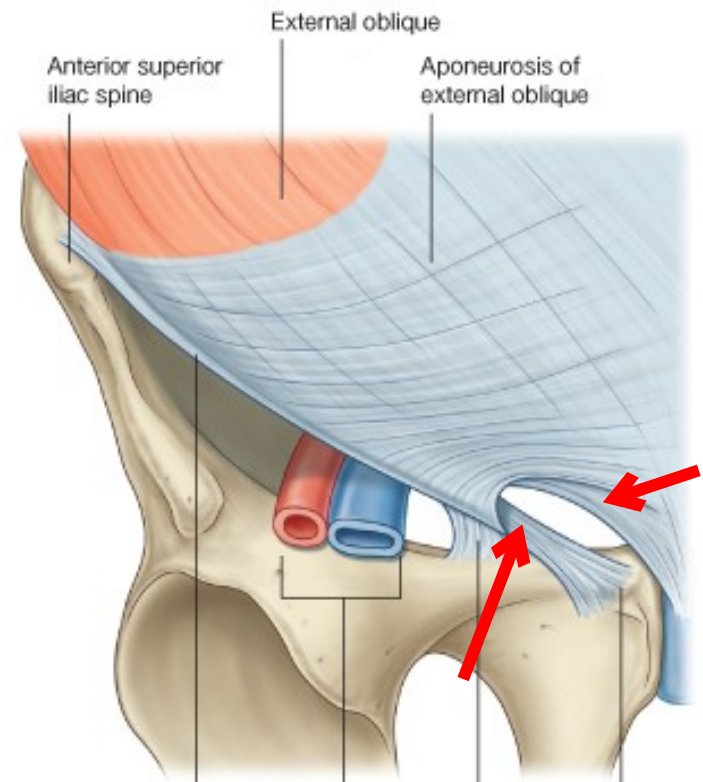
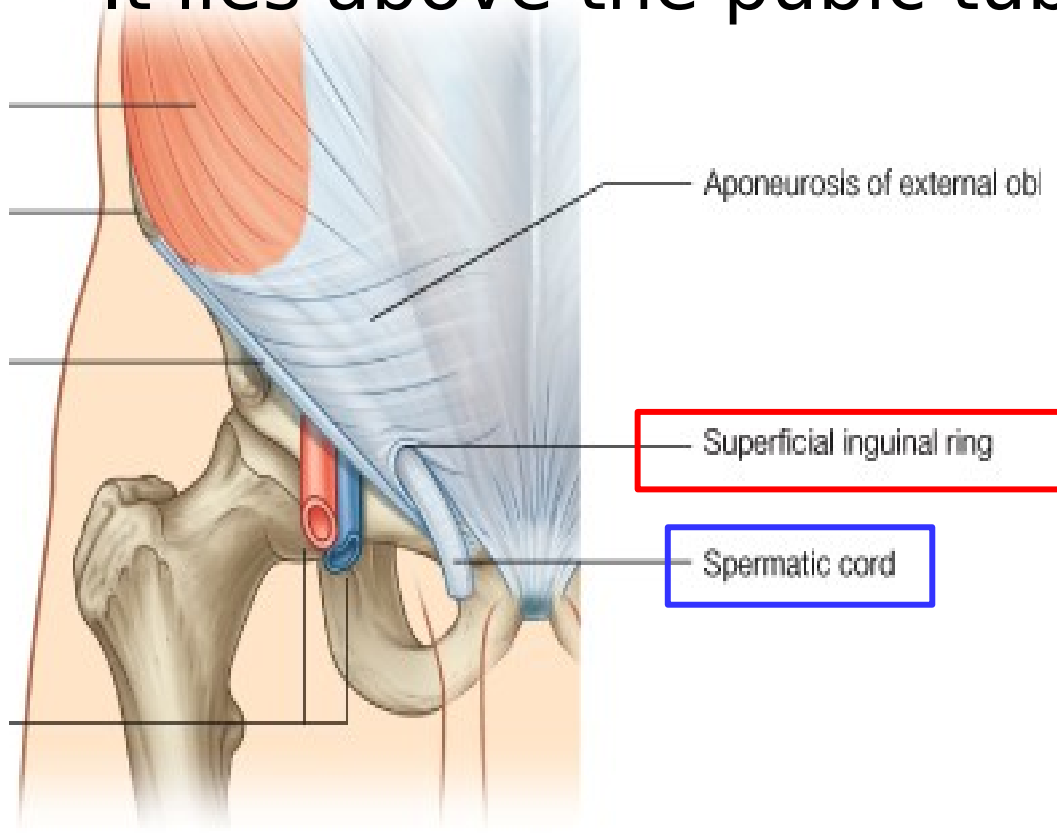
It is a lateral extension from posterior part of lacunar ligament & attaches to pectineal line

Ligament:

It is a triangular extension from the medial end of inguinal ligament.

Superficial Inguinal Ring

- ❑ It is a triangular opening in external oblique aponeurosis.
- ❑ It lies above the pubic tubercle

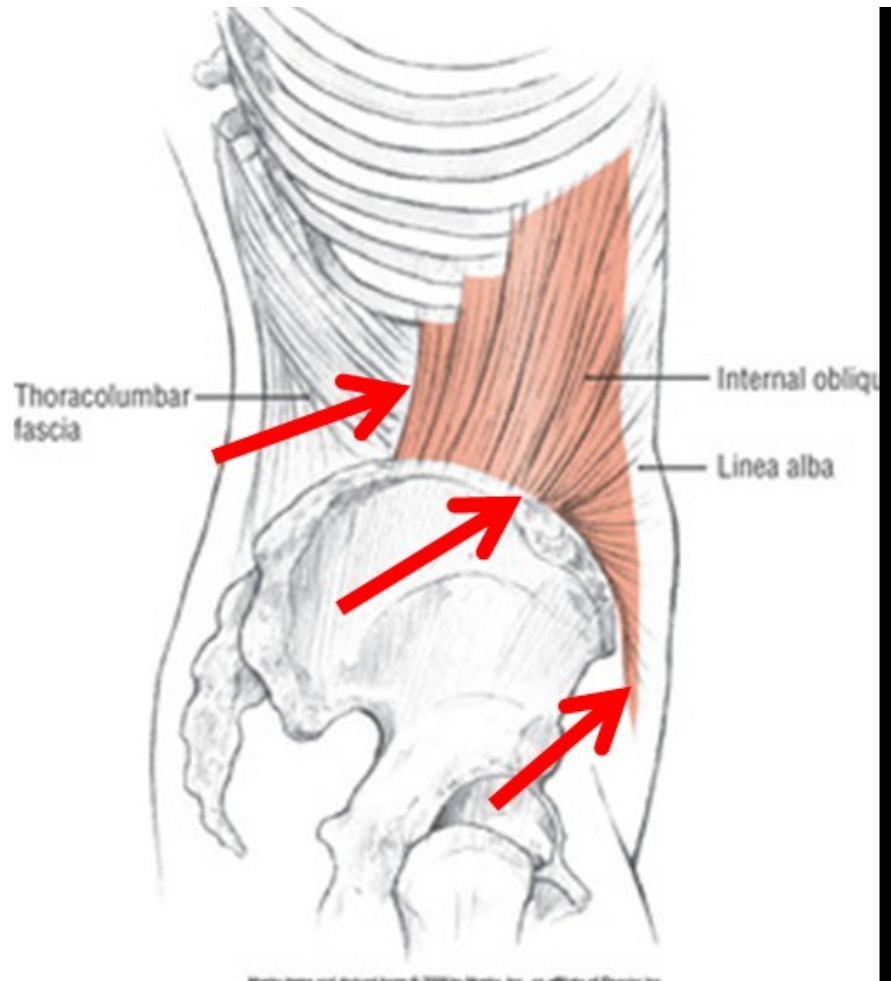


**lateral & medial
crura of the**

Internal Oblique Muscle

■ **Origin:**

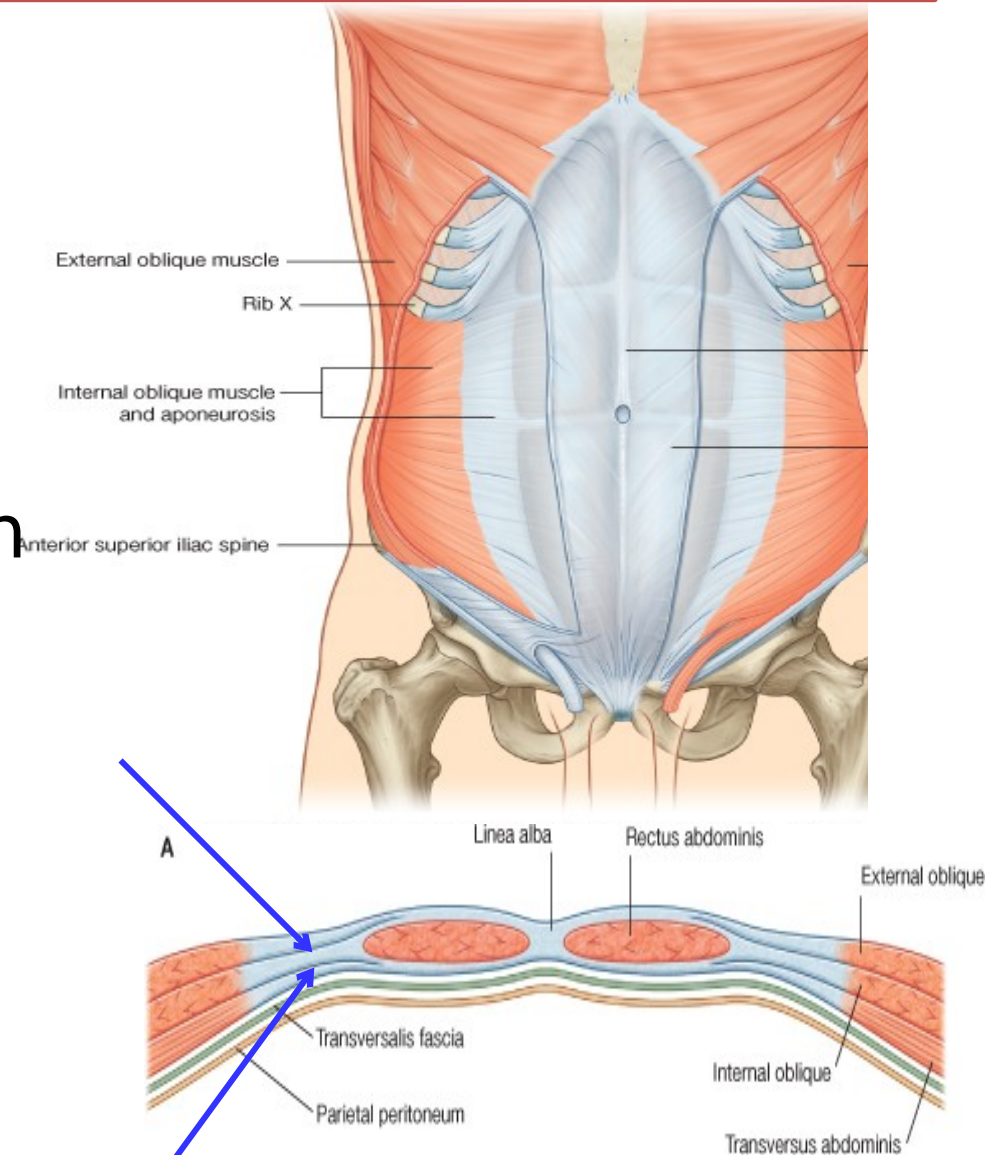
- a linear origin from the lateral $\frac{2}{3}$ of the inguinal ligament
- anterior $\frac{2}{3}$ of intermediate line of iliac crest
- from the lumbar fascia



Internal Oblique Muscle

Insertion □

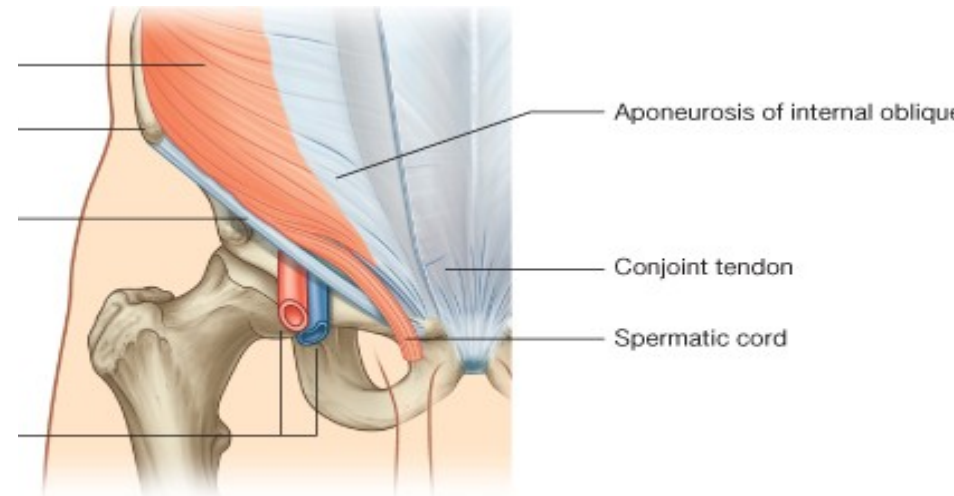
- lower 6 costal cartilages
- Aponeurotic insertion : xiphoid process, linea alba & pubic crest.
- The **middle part** of the internal oblique **aponeurosis** □ splits into **2 lamina** □ surround **rectus**



Internal Oblique Muscle

Insertion □

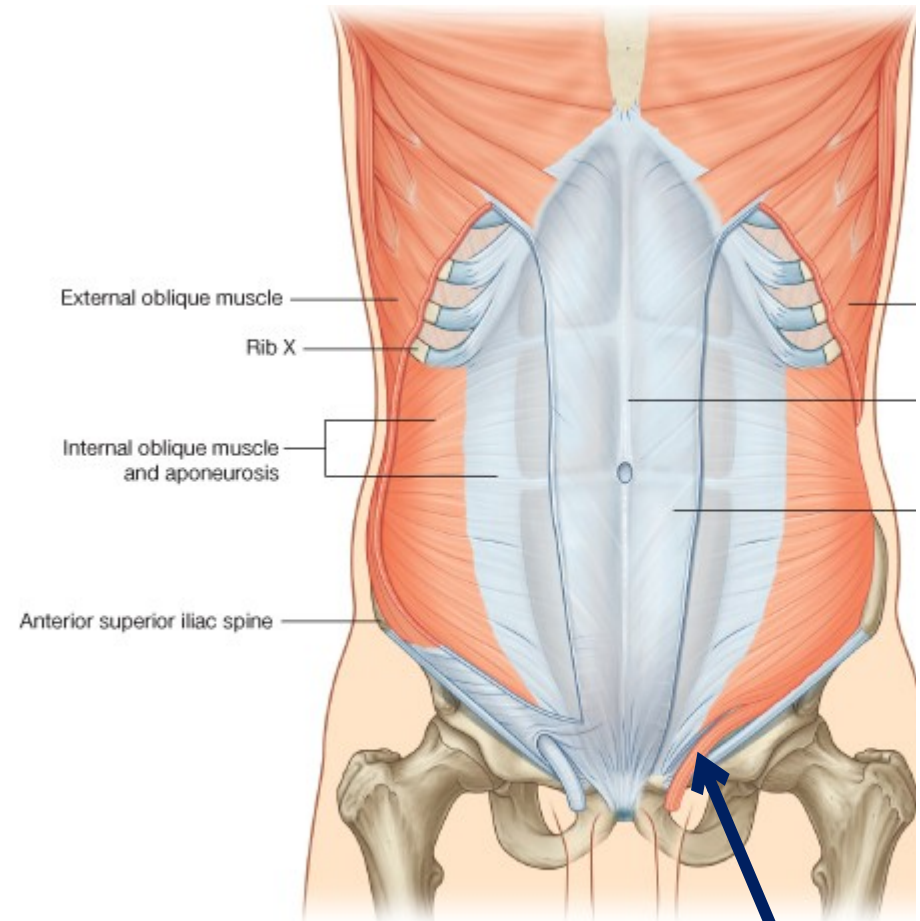
- lower 6 costal cartilages
- Aponeurotic insertion : xiphoid process, linea alba & pubic crest.
- **its lower fibers form an arch ends in pubic crest**



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CREMASTERIC MUSCLE

- **Origin:** from lower fibers of internal oblique \square fibers around spermatic cord.
- **Insertion:** Loops return up \square tendon in pubic tubercle.



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Transversus Abdominus

□ origin □

Costal cartilages of lower six ribs (ribs 7 to 12).

Lateral one-third of inguinal ligament.

Thoracolumbar fascia. Medial lip of iliac crest (ant. 2/3).

Most fibers pass in a transverse direction

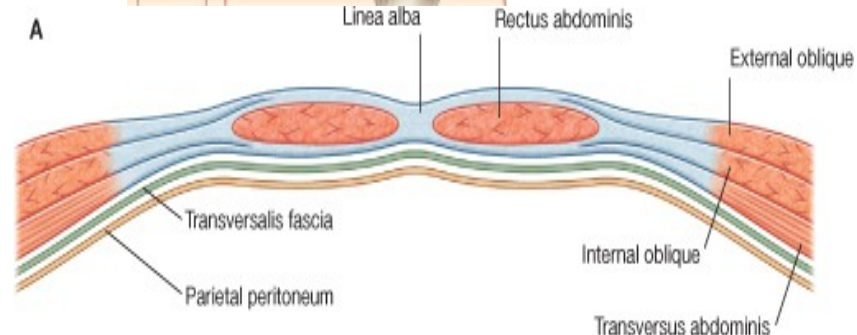
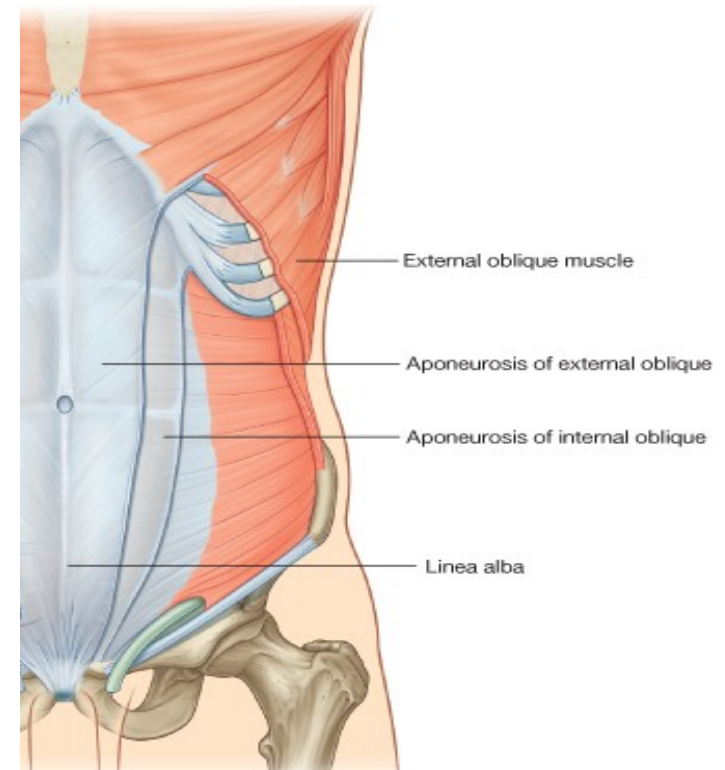


Transvers
us
abdominu
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Transversus Abdominus

-broad aponeurosis
into xiphoid process,
linea alba, pubic crest
and pectineal line.

-



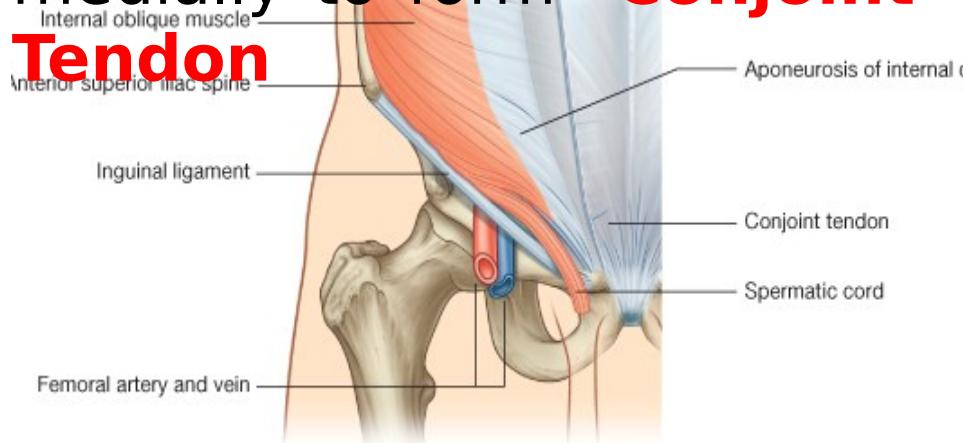
Internal Oblique Muscle

Transversus Abdominus

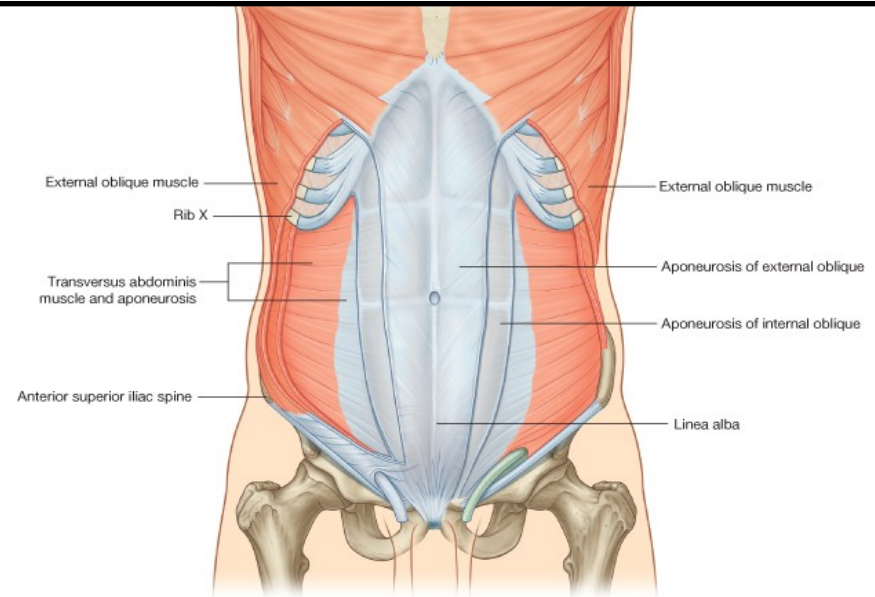
The **lower fibers of internal oblique and transversus abdominus ms. form an arch over the spermatic cord** (the arch of transversus abd. Is higher than that of internal obliq.)

Both archs fuse together medially to form **Conjoint**

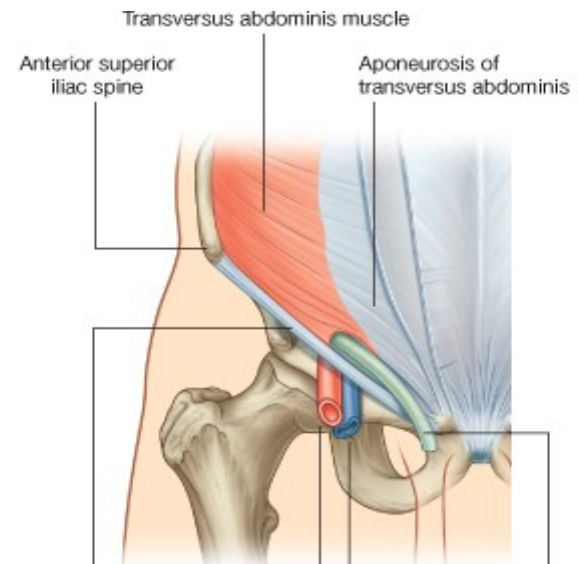
Tendon



→ **Conjoint Tendon**

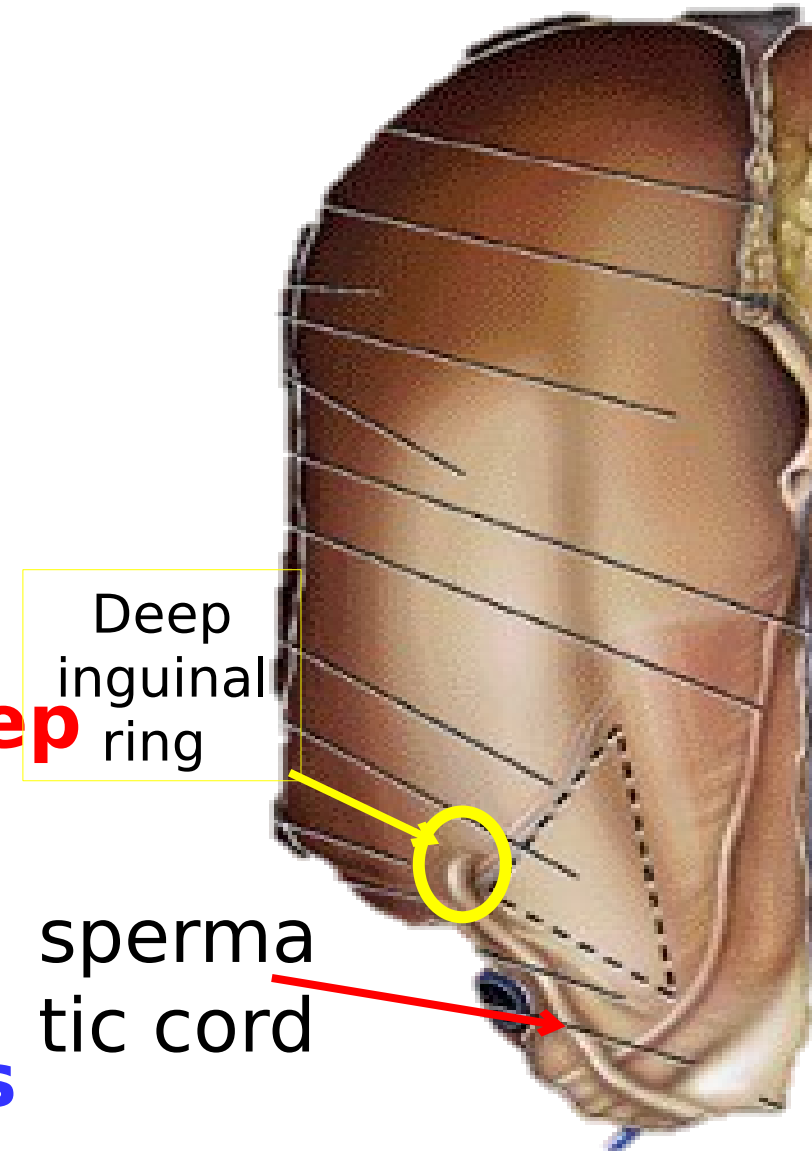


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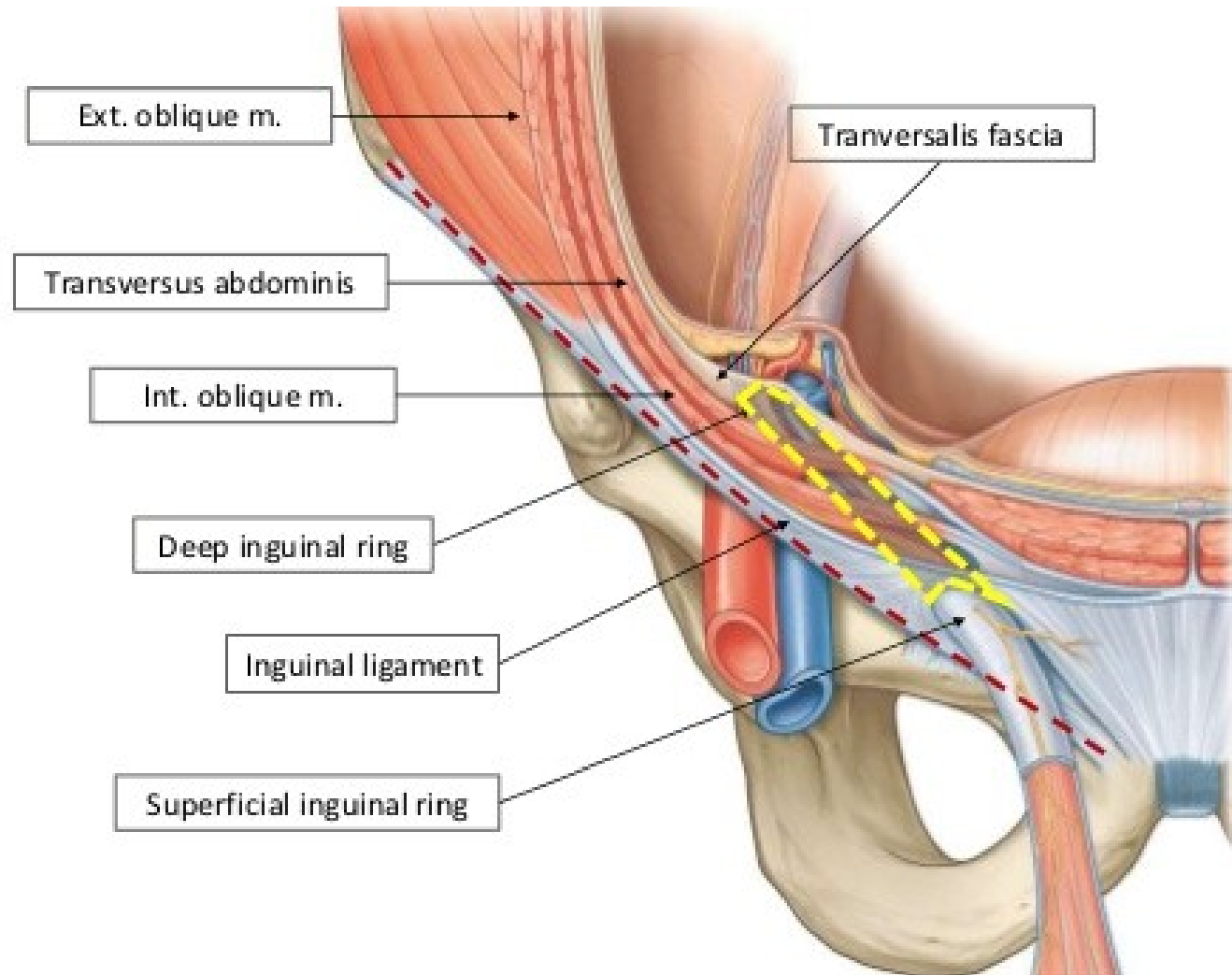


Fascia Transversalis:

- A thin membranous fascia deep to the transversus abdominis
- It is well defined in the inguinal region
- Above the level of the inguinal ligament, there is around opening called **Deep inguinal ring**
- This ring transmits the **spermatic cord in males**



Fascia Transversalis:



Rectus Abdominus Muscle

Position: lie on to either sides of midline.

Has 3-4 **tendinous intersections.**



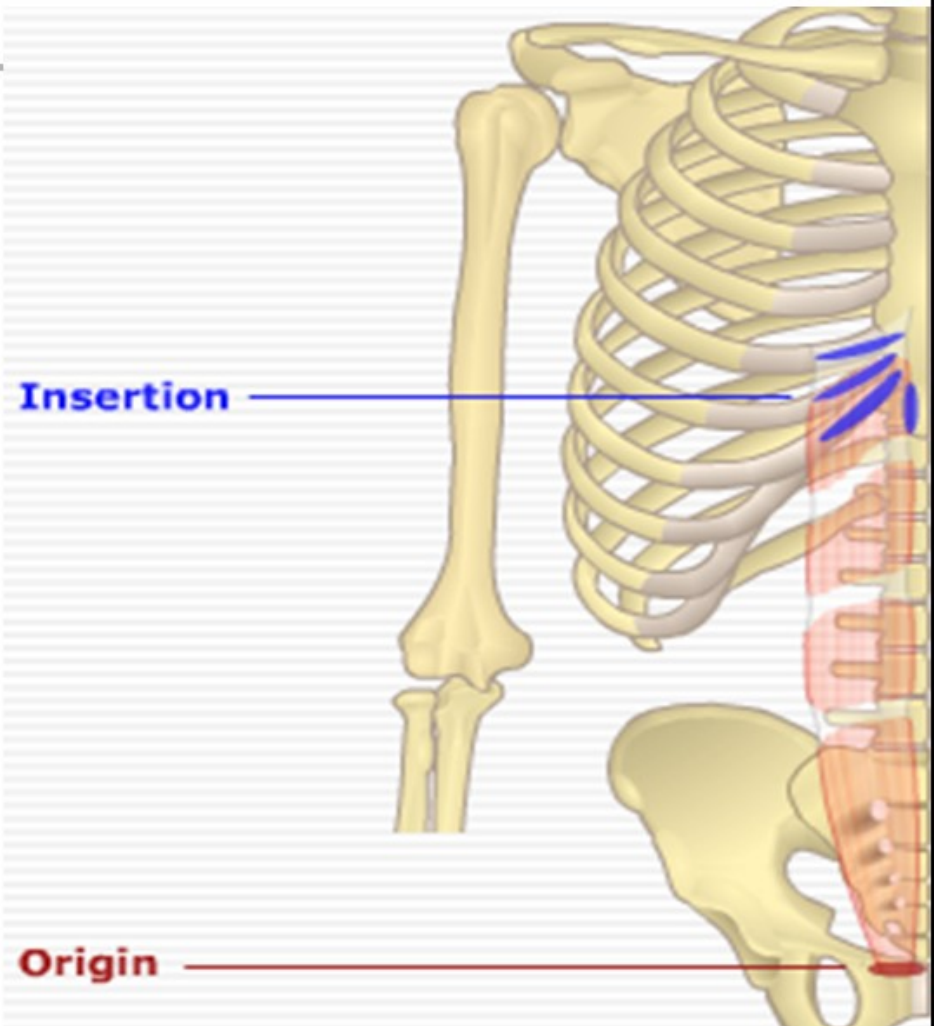
Rectus Abdominus Muscle

Origin:

Pubic crest,
Pubic tubercle

Insertion:

Costal cartilages of
ribs 5 to 7 and
xiphoid process.



Rectus abdominis

The lateral border of the rectus muscles assumes a convex shape that gives rise to the surface landmark, the *Linea Semilunaris*.



PYRAMIDALIS

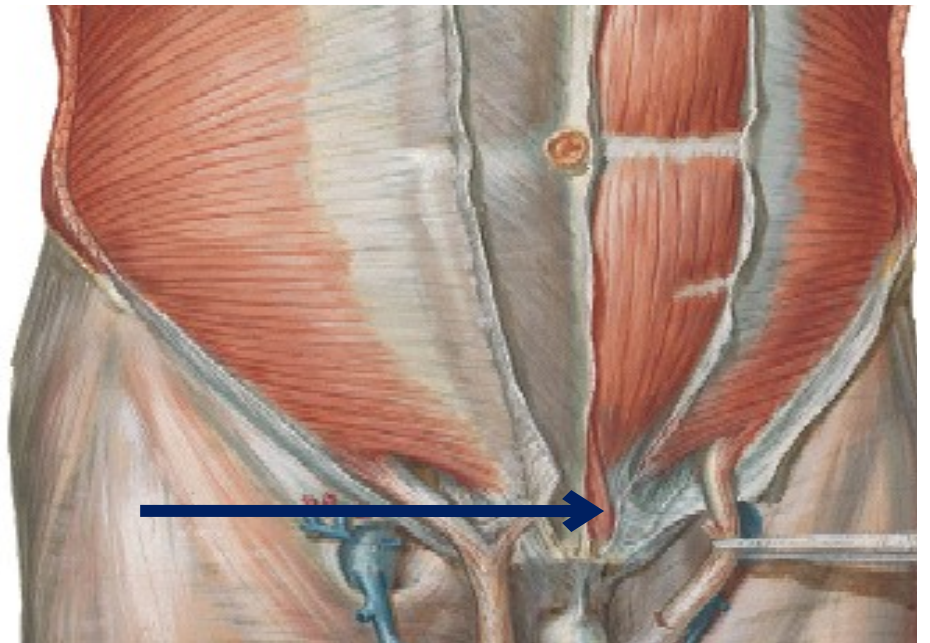
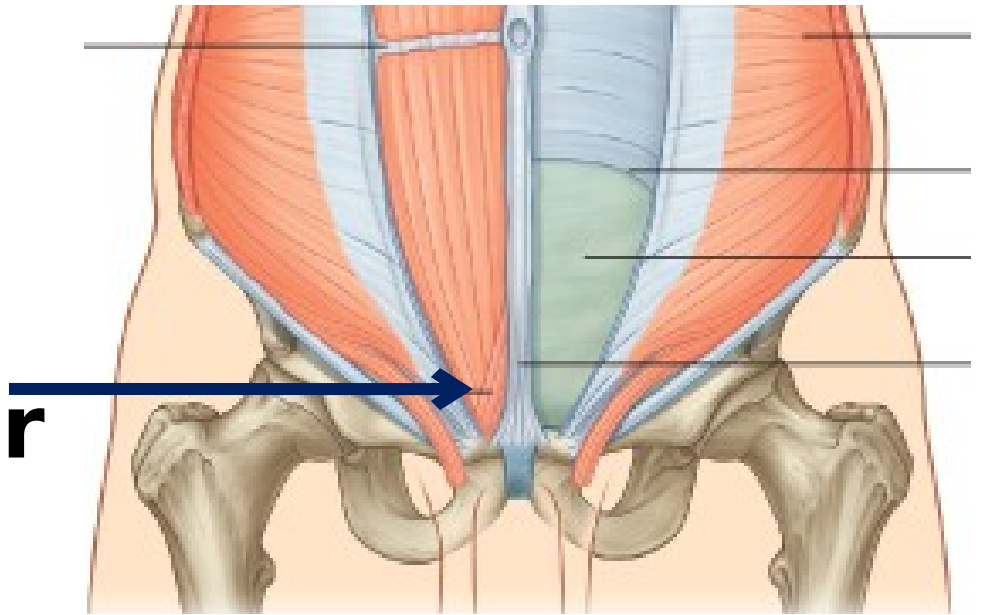
❑ This muscle may be absent (18%) on one or both sides

❑ **Origin:**

Front of pubis

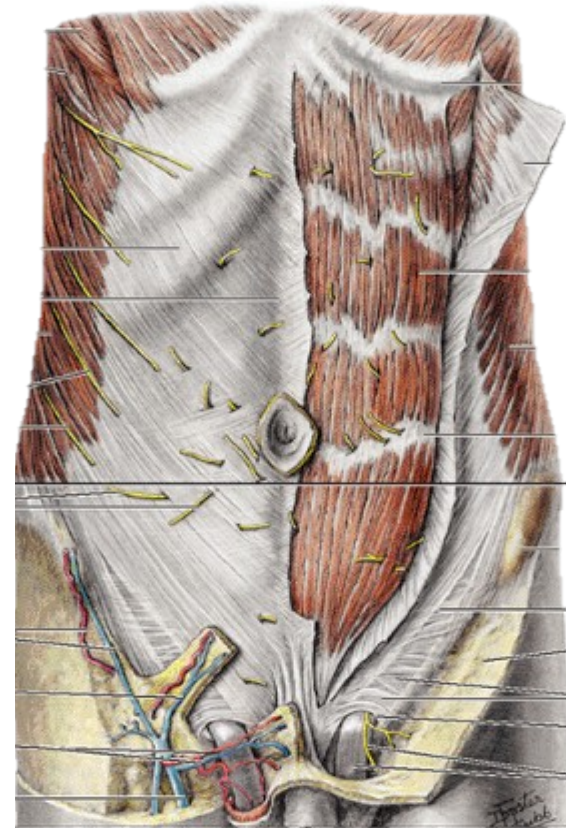
❑ **Insertion:**

Linea alba

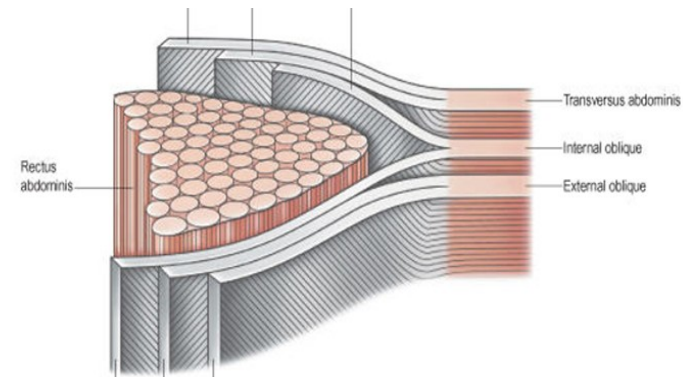


Rectus Sheath

The rectus abdominis and Pyramidalis muscles are enclosed in an aponeurotic tendinous sheath (the **Rectus Sheath**) formed by a unique layering of the aponeuroses of the external and internal oblique, and transversus abdominis muscles



The part of the envelope in front of the rectus muscle is the **anterior wall** while the part behind the muscle is the **posterior wall** of the rectus



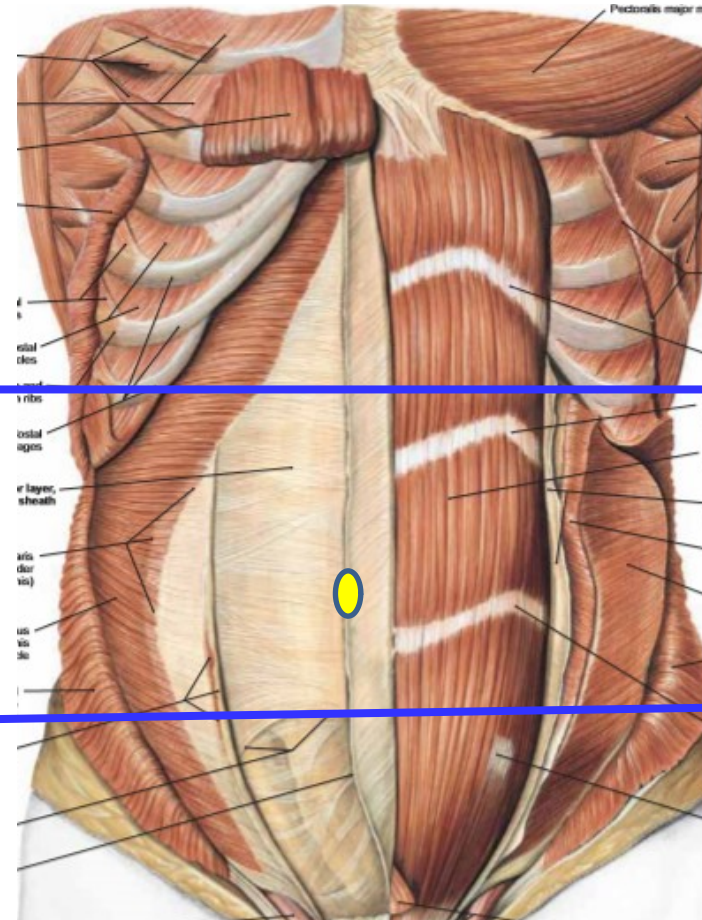
Rectus Sheath

3 zones:

zones 1. above costal margin.

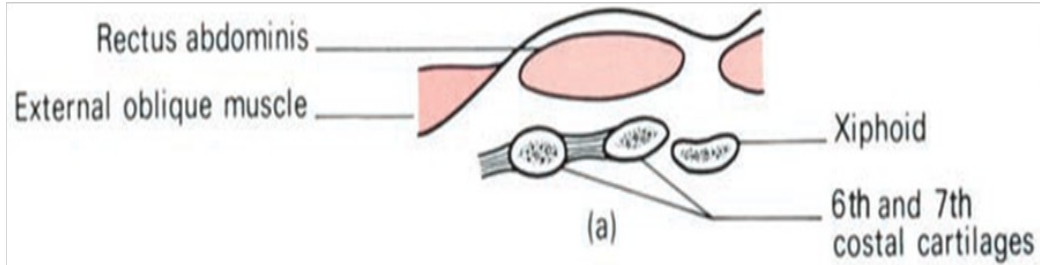
zones 2. between costal margin & a line midway between umbilicus & symphysis pubis.

zones 3. below the midway level --- till symphysis pubis

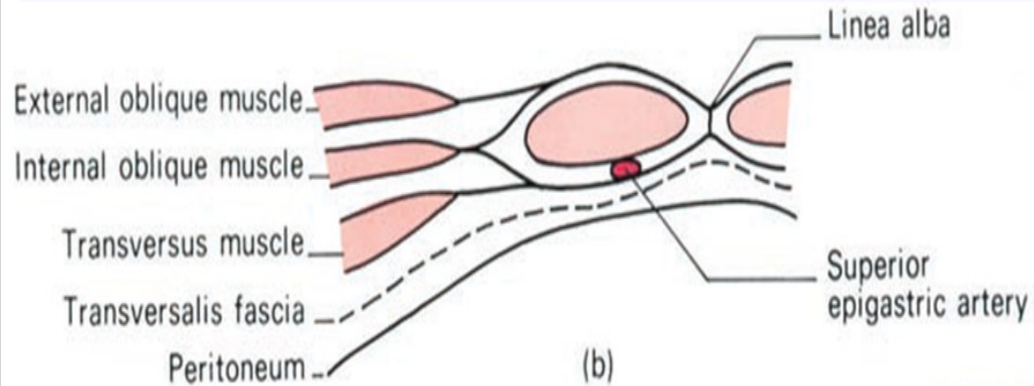


Rectus Sheath

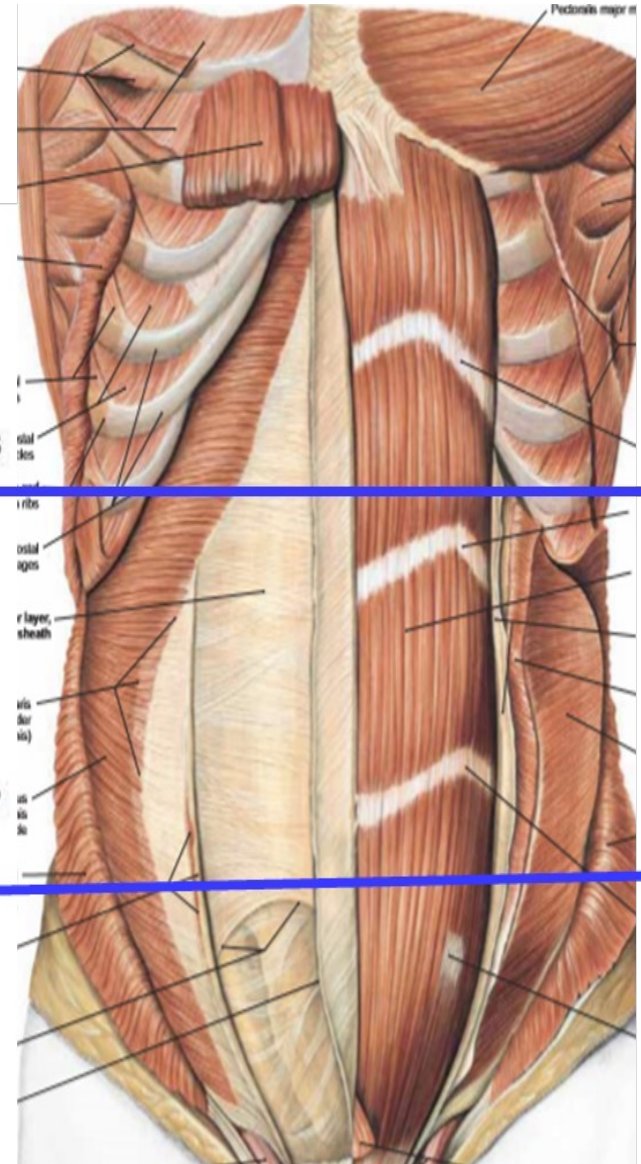
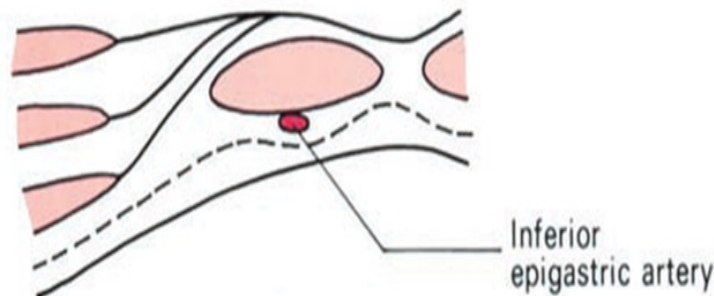
zone 1



zone 2

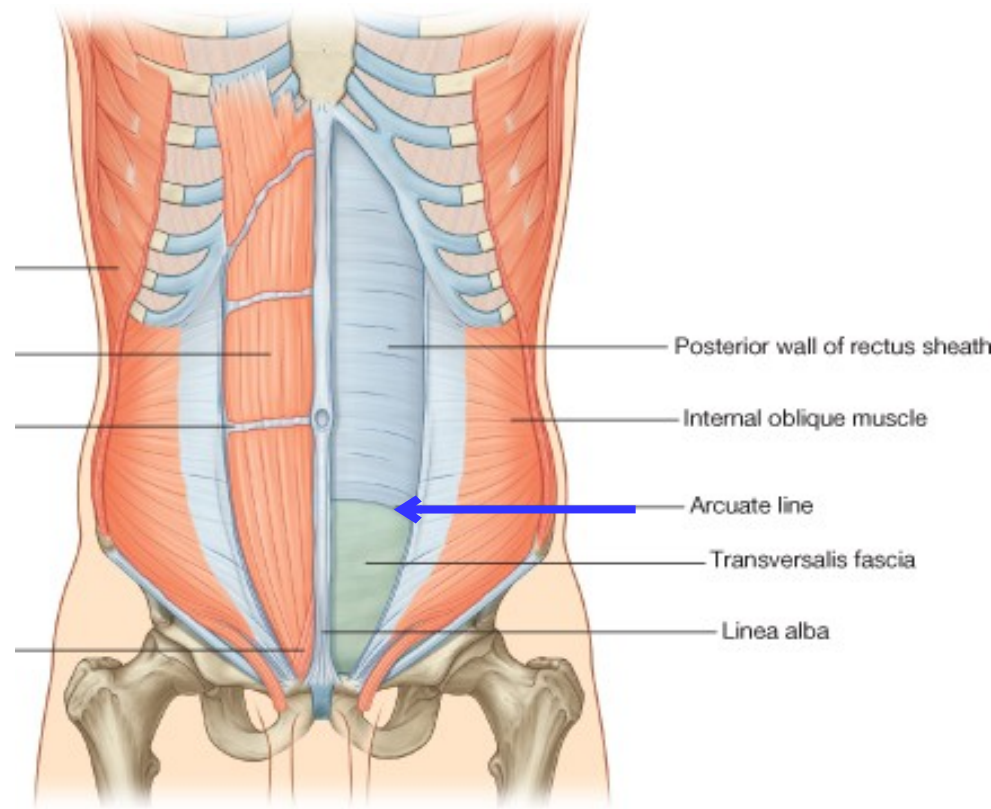


zone 3



Rectus Sheath

The aponeurotic post. wall of rectus sheath ends at a line midway between umbilicus & symp. pubis by forming an arched border called **Arcuate Line**



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Rectus Sheath

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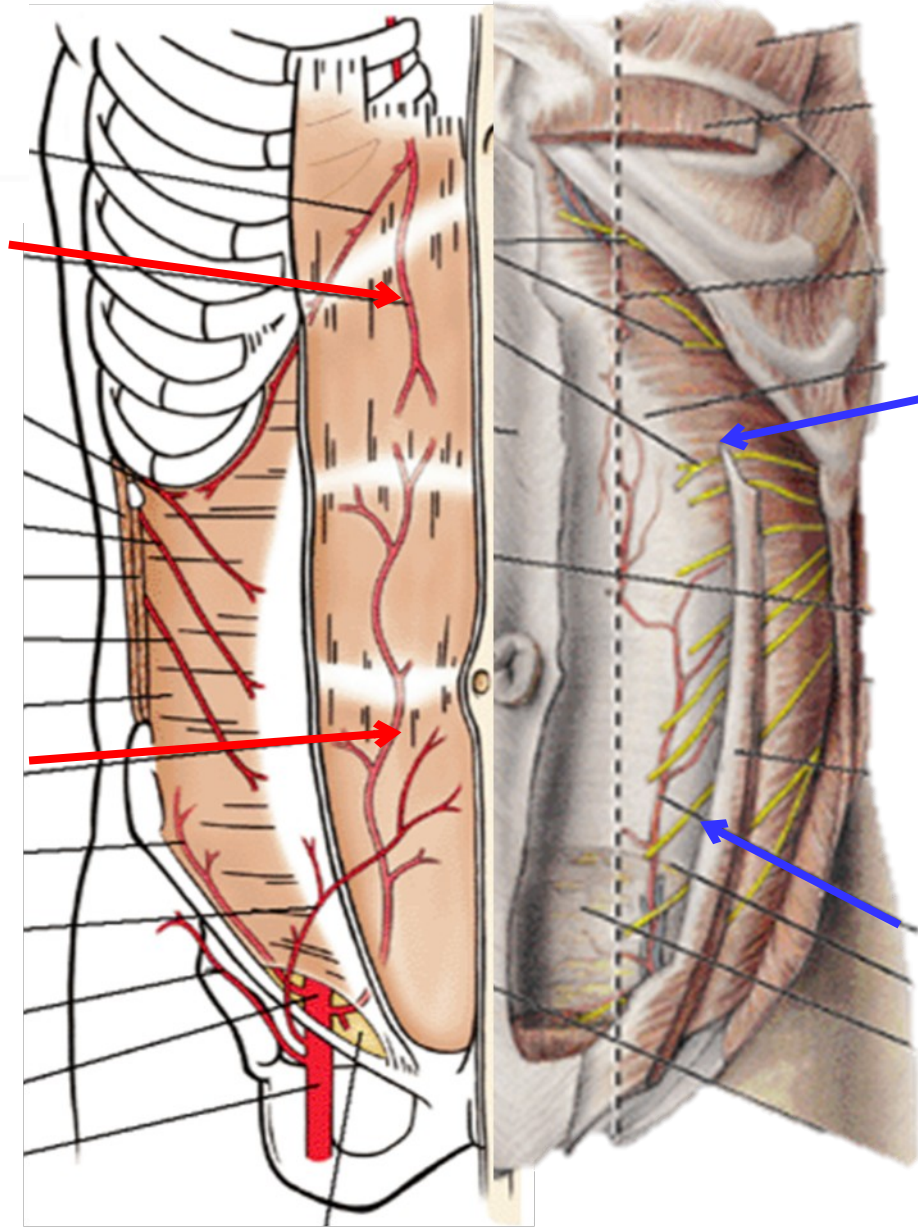
2 muscles
2 arteries
2 veins
6 nerves

Rectus abdominus.

Pyramidalis muscle (if present).

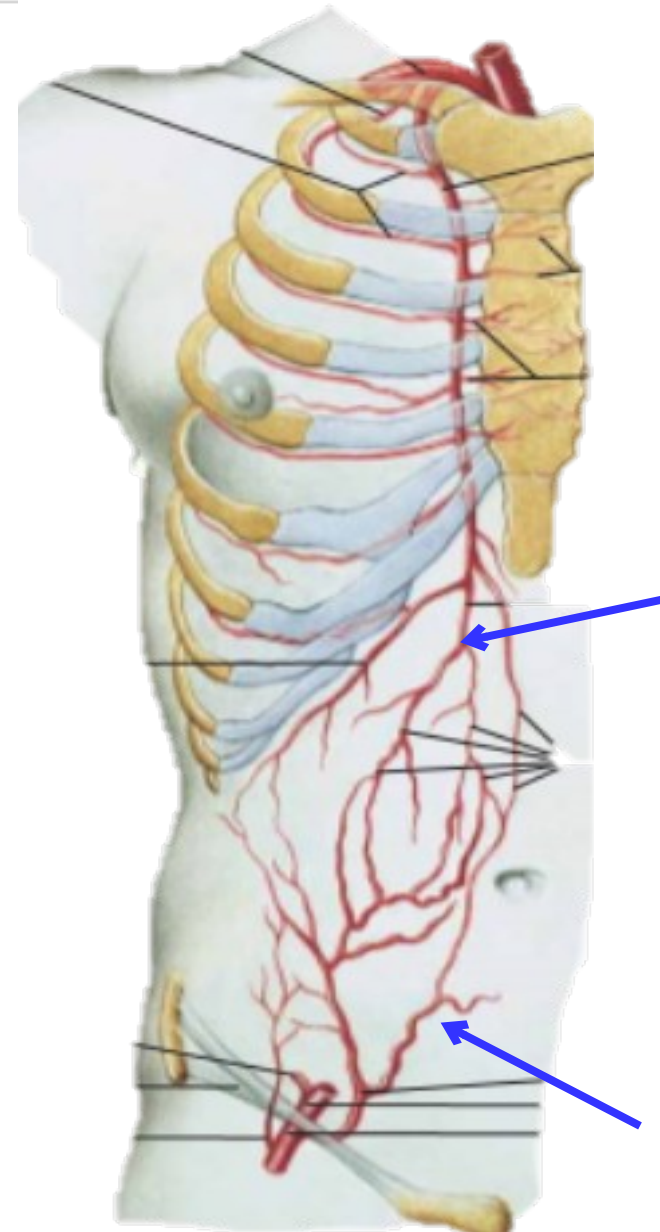
Superior and inferior epigastric arteries.

Anterior cutaneous branches of lower 5 intercostal nerves and subcostal nerve.

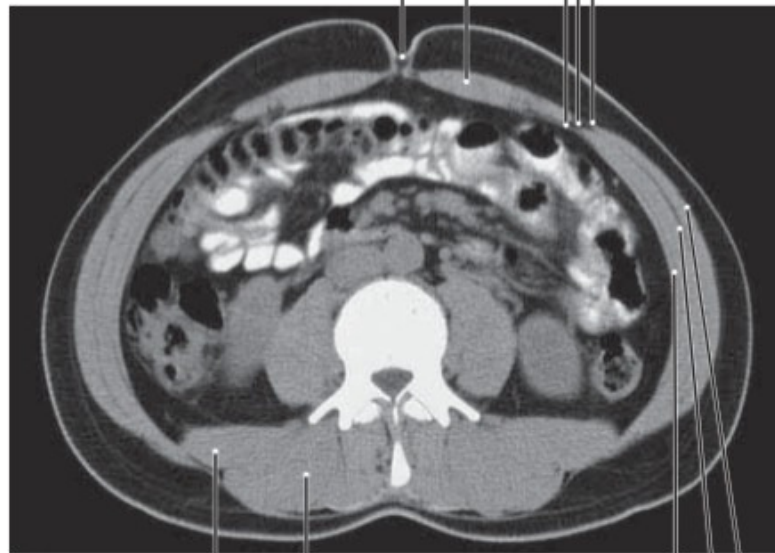


Arteries of anterior abdominal wall (Fig.16)

	<i>(1) Superior epigastric artery</i>	<i>(2) Inferior epigastric artery</i>
<i>Origin</i>	one of terminal branches of the internal thoracic artery	external iliac artery near its lower end.
<i>how enters the sheath</i>	by passing behind the 7 th costal cartilage between the costal & xiphoid origins of the diaphragm, crossing the upper border of TA.	just medial to the deep inguinal ring, pierces fascia transversalis at the lateral border of rectus abdominis & enters rectus sheath by passing in front of the arcuate line.
<i>Course</i>	within the sheath it runs vertically downwards.	within the sheath it runs vertically upwards.
	Both supply the rectus muscle, & ends by anastomosing with each other.	
<i>Branches</i>	<ul style="list-style-type: none"> - muscular. - cutaneous - hepatic branch which runs in the falciform ligament - anastomatic branch. 	<ul style="list-style-type: none"> - muscular. - cutaneous - cremasteric branch to the spermatic cord. - pubic branch.



External oblique, aponeurosis
Internal oblique, aponeurosis
Transversus abdominis, aponeurosis
Rectus abdominis
Umbilical ring



Quadratus lumborum
Erector spinae
Transversus abdominis
Internal oblique
External oblique

FIGURE 229.2 Computed Tomography (CT) of the Muscles of the Abdomen at the Level of the Umbilicus

External oblique, aponeurosis
Internal oblique, aponeurosis; transversus abdominis, aponeurosis
Rectus abdominis
Linea alba



Transversus abdominis
Internal oblique
External oblique
Ilium

FIGURE 229.3 CT of the Muscles of the Abdomen at the Level of the Fifth Lumbar Vertebra

INNERVATION OF ANT. ABD. WALL MUSCLES

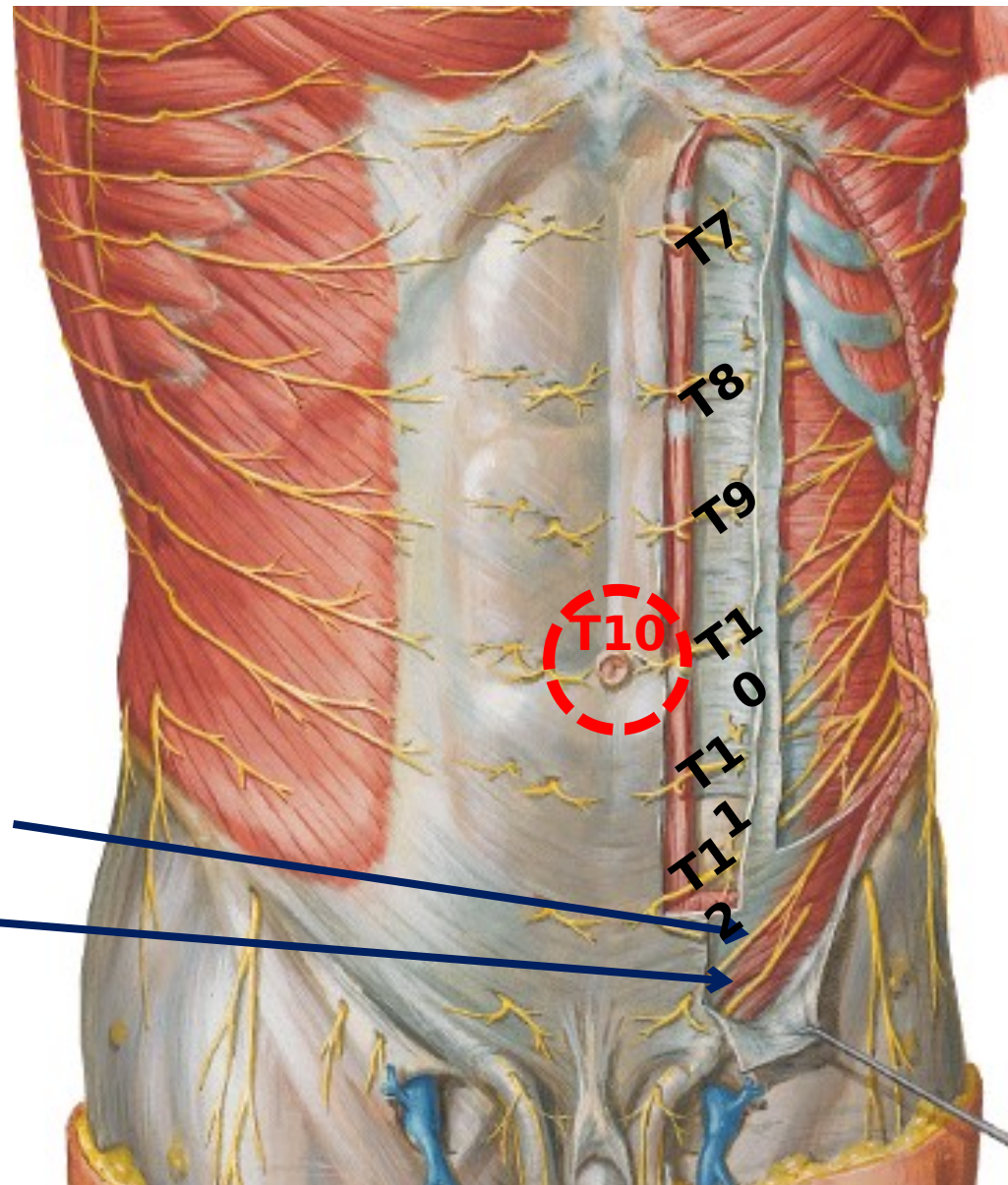
- **External oblique, internal oblique, transversus abdominis**
□ by lower six thoracic nerves + iliohypogastric & ilioinguinal n (L1)
- **Rectus abdominis** □ lower six thoracic nerves
- **Pyramidalis**: by T12
- **Cremasteric muscle**: by genital branch of genitofemoral n. (L1)

ACTION OF ANT. ABD. WALL MUSCLES:

- **Support abdominal contents.**
- **Expiration.**
- **Expulsive acts as vomiting, micturition, defecation, labour.**
- **Movements of the trunk:**
 - Flexion of the trunk □ rectus abdominis**
 - Lat. flexion & rotation of the trunk □ the 2 obliques**
- **Pyramidalis: tenses linea alba.**
- **Cremasteric: suspends & elevates the testis.**

Nerves of anterior abdominal wall:

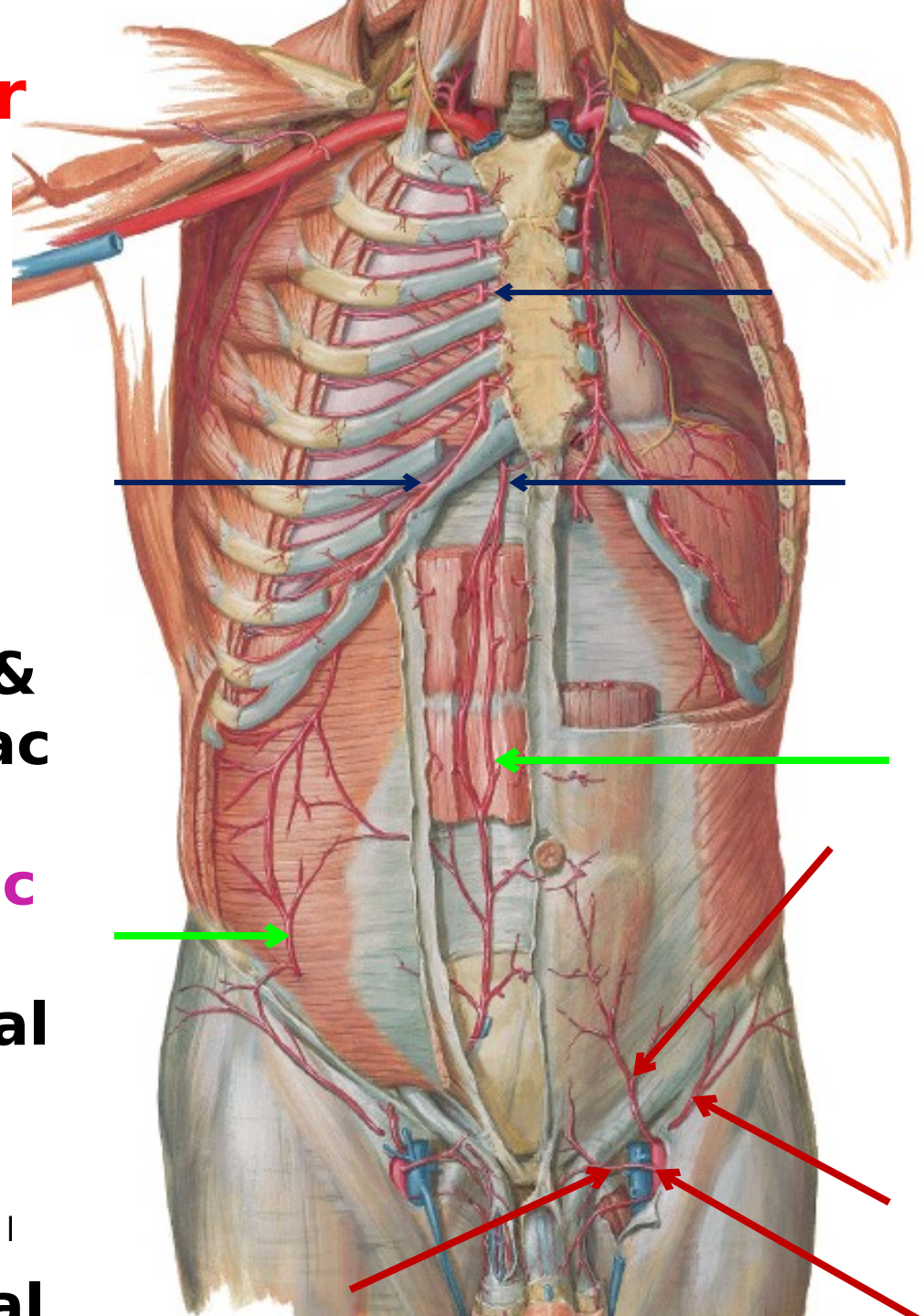
- ❑ Ant. abd. wall is supplied by ventral rami of lower 6 thoracic nerves & L1
- ❑ Lower 6 thoracic nerves run in the neurovascular plane then enter the rectus sheath
- ❑ L1 is represented by 2 nerves:
iliohypogastric & ilioinguinal.
- ❑ **These 2 nerves have 2 special features:**



Skin around umbilicus is supplied by T10

Arteries of anterior abdominal wall:

- 2 arteries from internal thoracic □ superior epigastric & musculophrenic
- 2 arteries from external iliac □ inferior epigastric & deep circumflex iliac
- 3 brs from descending thoracic aorta □ 10,11,12 posterior intercostal
- 3 brs from femoral artery □ superficial external pudendal/superficial

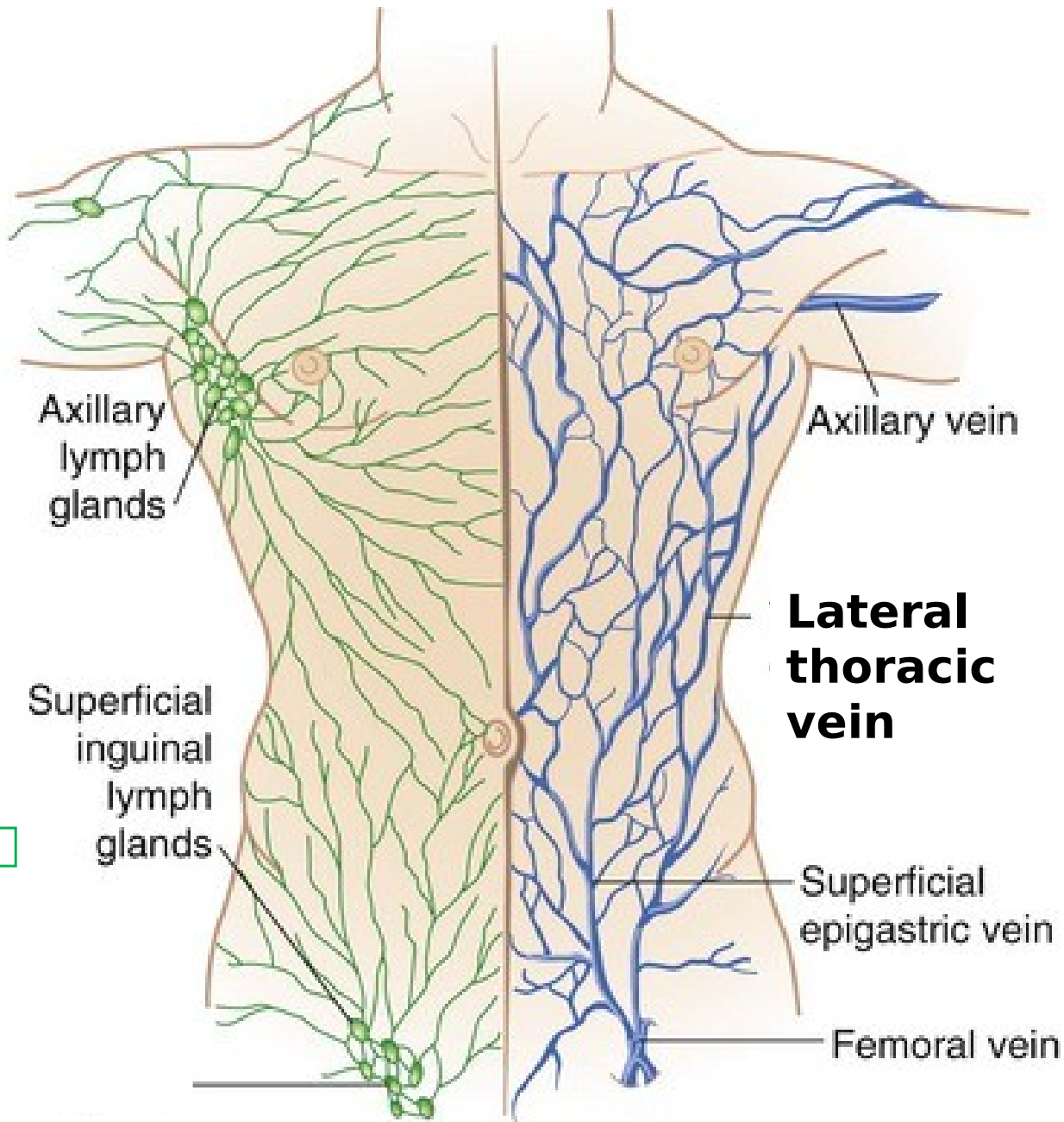


Superficial veins of ant. abd. wall:

- **Above umbilicus** ☐
 - lat. thoracic vein ☐
 - axillary v
- **Below umbilicus** ☐
 - veins accompany superficial inguinal arteries ☐
 - Great saphenous vein

Superficial Lymphatics of ant. abd. wall:

- **Above umbilicus** ☐
 - axillary L.N.
- **Below umbilicus** ☐
 - superficial inguinal L.N.



Lecture Quiz



Question 1

Enumerate contents of rectus sheath

Question 2

Describe anterolateral muscles present in anterior abdominal wall

SUGGESTED TEXTBOOKS



Clinical Anatomy for Medical Students .Richard S. Snell

Gray's anatomy for students . Page 245- 251